Final

SAFETY ELEMENT

Prepared for:
CITY OF SIMI VALLEY

September 1992

FINAL SAFETY ELEMENT
CITY OF SIMI VALLEY

* * * * *

Prepared By:

FUGRO-McCLELLAND (WEST), INC.
2140 Eastman Avenue / Ventura, California 93003

September 1992

Job Number 0901-9733

GOALS, POLICIES, AND IMPLEMENTATION MEASURES
of the
SAFETY ELEMENT

TABLE OF CONTENTS

8.0 SAFETY ELEMENT

8.1 INTRODUCTION

The objective of the Safety Element is to reduce loss of life, injuries, and property damage, and economic and social dislocation resulting from fire, geologic hazards, and other natural or man-made hazards. To accomplish this objective, the Safety Element must identify and evaluate potential public safety hazards within the planning area and include policy and programs for the protection of the community from unreasonable risks associated with hazards.

Potential geologic and urban environment hazards required to be addressed in the Safety Element include:

- o Seismically-induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure

- o Slope and ground instability leading to mudslides, landslides, subsidence, and other geologic hazards

- o Flooding

- o Wildland and urban fires

Each of the above hazards has been evaluated in the Simi Valley Safety Element, with the exception of tsunamis (seismic sea waves), which do not have the potential to result in a safety risk in Simi Valley. In addition to the required safety issues, this Safety Element addresses potential hazards from hazardous materials and from structures incapable of adequately resisting ground movement caused by earthquakes.

The Simi Valley Safety Element has evaluated potential safety hazards and contains goals and policies intended to reduce the risk of loss of life, injury and property damage from these hazards. The hazard evaluation and goals and policy statements are intended to be applied to projects within the City and during the

review of projects located within the City's Sphere of Influence and Area of Interest.

When used in this Element, the term "critical facilities" includes, but is not limited to the following: dams, electrical substations, schools, fire stations, city buildings, hospitals, sewage treatment plants, water works facilities such as tanks and pumping stations, radio stations, law enforcement offices, major highways and bridges, and major underground or overhead utilities, such as gas, petroleum, or electricity.

8.1.1 Limitations

The Safety Element is a general discussion of potential public safety hazards on a city-wide basis. The hazard identification and evaluation is based on general literature available at the time of plan preparation. No site specific evaluation was performed for this plan.

However, the maps in this plan show the general areas of potential hazards, but should not be interpreted to precisely define hazard areas. The Safety Element is intended to be used for general land use planning and should not be used as a substitute for detailed site investigations normally required for new development.

8.1.2 Organization

The Safety Element is presented in two parts. The first part contains the goals and policies to be incorporated into the Simi Valley General Plan. The second part is Technical Appendix J that discusses geologic and safety hazards in the City, standards and objectives for new development, and existing programs to reduce the risk presented by identified geologic and safety hazards.

8.2 ISSUES AND OPPORTUNITIES

The City of Simi Valley is subject to the potential occurrence of various natural processes that pose a risk to people and property including flooding, fire, and earthquake related activity. Technical background material on these topics can be found in Technical Appendix J of the General Plan. The maps included in this

Element illustrate the areas of the Simi Valley region that are prone to geologic and soils hazards, fire and flood hazards, and the location of critical facilities.

Flood Hazards

- Portions of the City are exposed to potential flooding resulting from a 100-year storm event. These areas include the Arroyo Simi and most of the existing flood control channels.

- Significant downstream flooding has caused substantial damage to agricultural lands on the Oxnard Plain.

- Existing drainage facilities within the City limits consist of County-maintained "red line" channels and City-maintained secondary drains.

- A number of existing facilities are of insufficient size to accommodate projected flows resulting from increased development, and several areas of the City experience drainage problems.

- Hillside canyons offer an opportunity to reduce or provide mitigation from impacts of excessive stormwater runoff through the construction of detention facilities to reduce peak flows.

- In hillside areas, it is advantageous to protect and utilize existing natural channels. Such an effort should be incorporated into future planning because it provides aesthetic benefits, meets drainage needs, and controls system costs.

Fire Hazards

- The hillsides and canyons extending beyond the valley floor pose significant fire hazards to development in these areas due to excessive fuel loading, difficult terrain and summertime climate conditions.

- Development allowed in areas defined by the Fire District as having significant risk of fire shall minimize the potential of fire by implementing brush removal operations, fire access, and fire-resistant vegetation planting.

- Areas considered to be very high fire hazard areas include the Santa Susana Mountains to the north, the Simi Hills to the south and generally east of Meier Canyon, and the western portion of the City north of Madera Road and south of the Arroyo Simi.

<u>Seismic Hazards</u>

- The City of Simi Valley is located in an area subject to strong groundshaking from earthquakes.

- The City is located near several active faults (Ventura, San Fernando, and the San Andreas) and on or near several faults (Simi-Santa Rosa and the Santa Susana) not listed as active by the State of California. Other faults may impact the Simi Valley area which are yet unmapped.

- Areas of high groundwater present a potential ground failure problem from liquefaction of soils subjected to seismic shaking. Areas of high groundwater have been identified at the eastern and western end of the valley.

- Some hillside areas in the City include recent or ancient landslides which do not provide a stable base for structures and require removal or stabilization prior to development.

<u>Other Issues</u>

Peakload water supply requirements are addressed in the Community Services Element. Emergency evacuation routes and minimum road widths and clearances around structures, as they relate to fire and geologic hazards, are addressed in this element.

8.3 GOALS AND POLICIES

The purpose of the Safety Element is to ensure that the community is reasonably protected from injuries, property damage, or loss of life that may result from natural or man-made hazards by reducing the risk of exposure.

The goals for the Safety Element are listed below. Following each goal are policies that, when implemented, will assist the City in achieving the stated goal. Proposals for new development must be consistent with the policies of the Safety Element.

GOAL VIII-1: MINIMIZE THE HAZARDS TO PUBLIC HEALTH, SAFETY, AND WELFARE AND PREVENT LOSS OF LIFE, BODILY INJURY, AND PROPERTY DAMAGE RESULTING FROM NATURAL AND MAN-MADE HAZARDS.

Protection and Hazard Avoidance

Policy VIII-1.1: The City shall continue to cooperate with and support the federal, state, and county agencies responsible for the enforcement of federal, state, and local health, safety, and environmental laws.

Policy VIII-1.2: To the extent feasible, development should be directed to those areas which avoid unacceptable risk to public health and safety.

Policy VIII-1.3: Development shall not be allowed in areas with a significant potential for a natural disaster without adequate mitigation that reduces potential safety hazards to an acceptable level.

Policy VIII-1.4: New development shall not subject other property to unacceptable hazards or risk of natural disaster.

Policy VIII-1.4.1: Development shall be designed to mitigate storm flows at peak discharge. Detention facilities shall be based upon the Master Plan of Drainage.

Policy VIII-1.4.2: Drainage facilities for developments shall be designed so that vehicle and pedestrian use of roads is not unreasonably restricted, and road improvements and adjacent properties are not severely damaged in the event of a flood.

Policy VIII-1.4.3: The ability of emergency services to provide adequate public protection should not be significantly affected by any urban development.

Policy VIII-1.4.4: Hillside development shall receive special design review to evaluate and mitigate those additional problems associated with development in hillside areas.

Geologic-Seismic Hazards

Policy VIII-1.5: Ensure compliance with local and state regulations regarding the identification and mitigation of geologic and seismic hazards.

Policy VIII-1.6: Require that adequate soils, geologic and structural evaluation reports are prepared when deemed appropriate by the City Engineer.

Policy VIII-1.7: Review the Safety Element and policies and comprehensively revise them whenever substantially new scientific evidence becomes available regarding seismic and geologic hazards in the Simi Valley area.

Policy VIII-1.8: To ensure the availability of adequate geologic-seismic information for protection against seismic hazards, a thorough geologic-seismic investigation shall be performed for all new developments proposed within a critical distance of the mapped, inferred or known trace of the Simi-Santa Rosa fault, Santa Susana fault, or other active or potentially active fault. Where the trace of the fault is not precisely known, and based on the judgment of the City Engineer, a geologic-seismic investigation may be required to determine that location.

Policy VIII-1.9: No new structures shall be built atop, astride or within a critical distance of the demonstrated location of an active or potentially active fault.

Policy VIII-1.10: Approvals of construction or reconstruction of linear structures (i.e. oil pipelines, major water and sewer lines, etc.), that cross or are designed to cross a fault with ground rupture potential, shall require that the structure be equipped with automatic shut-off valves to minimize the loss of fluid in the event of a pipeline rupture.

Policy VIII-1.11: The City should adopt and, if necessary, amend the most current version of Chapter 70 of the Uniform Building Code and Chapter 6 and 7 of the Ventura County Land Development Manual to ensure maximum seismic protection and the application of up-to-date state-of-the-practice grading and drainage policies.

Policy VIII-1.12: For proposed developments within potential liquefaction, soil collapse, peat oxidation settlement, and/or soil expansion hazard areas, a soils investigation to assess the extent of the hazard shall be conducted and a report submitted to the City Engineer.

GOAL VIII-2: IN HILLSIDE AREAS, ENSURE THE MAXIMUM FEASIBLE LEVELS OF SAFETY TO BOTH EXISTING AND FUTURE HILLSIDE DEVELOPMENT WHICH IS SUBJECT TO SLOPE AND GROUND STABILITY HAZARDS.

Slope and Ground Stability Hazards

Policy VIII-2.1: Hillside development shall receive special design review to evaluate and mitigate slope and ground stability hazards associated with development in hillside areas.

Policy VIII-2.2: The City should secure a detailed geologic material, foundation and structural study of each significant landslide which creates major damage to structures or public improvements. The

information gained from these studies should be used to revise or update policies for protection from ground stability hazards.

Policy VIII-2.3: After a major earthquake, the City, as determined by the City Engineer, should conduct inspections of hillside areas near occupied structures to identify any landslides created by the earthquake, and any potential landslides that could be triggered by aftershocks.

GOAL VIII-3: ADOPT PROGRAMS AND PROMOTE ACTIONS THAT WILL MINIMIZE LOSS OF LIFE, INJURIES, AND PROPERTY DAMAGE RESULTING FROM FLOODING.

Water-Related Hazards

Policy VIII-3.1: Development shall be required to protect projects and downstream uses from flooding and to mitigate on-site and downstream flooding. The City should continue to require detention of significant increases in peak runoff due to development.

Policy VIII-3.1.1: The City should continue to review and evaluate proposed land uses which are subject to flood inundation by a 100-year storm.

Policy VIII-3.2: No new critical facilities shall be located within an area subject to significant inundation during a 100-year flood event unless the facility can be adequately protected from inundation. Access to critical facilities shall be adequately protected from flooding.

Policy VIII-3.2.1: Developments shall be designed to prevent inundation of ground floors of structures during the 100-year flood event.

Policy VIII-3.3: Development shall be designed to mitigate impacts of storm flows at peak discharge. The provision of major detention facilities shall be based upon the Master Plan of Drainage.

Policy VIII-3.4: The City of Simi Valley should encourage the provision of new flood control facilities where they are appropriate or necessary.

Policy VIII-3.5: Drainage channels that do not create an unacceptable flood risk or public safety hazard should be retained in their natural state. Required flood improvements, where feasible, shall incorporate aesthetic design treatments.

Policy VIII-3.6: Develop and maintain a dam failure inundation warning plan to alert affected governmental agencies, residents, and businesses located in the potential hazard areas. This dam failure inundation plan should be coordinated with local television and radio media to assure early and effective evacuation.

Policy VIII-3.7: New development shall be strongly discouraged within dam failure inundation areas, except for agricultural, recreational, and roadway uses that are consistent with public safety.

GOAL VIII-4: CONTINUE THE IMPLEMENTATION AND ENFORCEMENT OF FIRE PREVENTION PROGRAMS TO MINIMIZE FIRE HAZARDS TO AN ACCEPTABLE LEVEL OF RISK.

Fire-Related Hazards

Policy VIII-4.1: The City should continue to cooperate with the Fire Protection District enforcement of an ordinance requiring the installation of fire sprinklers in new buildings exceeding 5,000 square feet or more than three (3) stories in height or more than five (5) miles travel distance to a fire station.

Policy VIII-4.2: Development in high fire hazard areas shall have special fire retardant construction standards and access features.

Policy VIII-4.3: New, non-pressure treated wood shake or shingle roofs shall be prohibited within the City of Simi Valley and all wooden roof coverings shall be prohibited in high fire hazard areas.

Policy VIII-4.4: The City should continue to cooperate with the County ordinance which requires that weeds and brush be cleared from all vacant lots and within 100 feet of all structures located in fire hazard areas. Non-compliance can result in the Fire Department hiring crews to remove weeds with the cost being assessed to the property owner.

Policy VIII-4.5: All new development shall meet minimum fire flow requirements for the availability, storage, and distribution of water. Water provided by water purveyor hydrants is preferred to private water systems (tanks). Mitigating measures such as automatic fire sprinklers, area separation walls, and/or type of building construction will influence fire flow requirements.

Policy VIII-4.6: The City should continue to require applicants of large, complex developments to retain a consultant to develop a fire protection plan for the proposed project.

Policy VIII-4.7: The City, acting on its own and in support of the programs of other agencies, should take actions to reduce the risk of fire associated with vegetation in high fire hazard areas.

Policy VIII-4.8: The City should limit the use of off-road vehicles in high fire hazard areas.

Policy VIII-4.9: The City should continue to cooperate with the Fire Protection District in the enforcement of the Uniform Fire Code.

Policy VIII-4.10: The City should ensure that all new developments have adequate access for fire equipment.

Policy VIII-4.10.1: The City should support efforts to ensure that all new and existing buildings be provided with approved numbers or addresses in such a position as to be plainly visible and legible from the street or road fronting the property. Said numbers shall contrast with their background.

Policy VIII-4.10.2: All new development shall meet minimum standards as outlined in the County road standards and private road standards for access, circulation, and minimum road widths. Such standards shall cover but are not limited to: maximum grade, minimum turning radius, type of surface, weight capacities of bridges, vertical clearance, gates, obstructions, width, second accesses, cul-de-sacs with a maximum length of 800 feet and turnarounds. Improvements may be imposed within or outside the boundaries of the project.

Policy VIII-4.10.3: Subject to the development review process, developments in high fire hazard areas may be required to provide a location for helicopter operations during vegetation fires and other emergencies. Helispot locations require vehicle access and water.

Policy VIII-4.10.4: Developments in high fire hazard areas shall have at least two vehicular access/exit points. Two access/exit points will be required during the project construction phase.

Policy VIII-4.11: The City should make provisions to provide adequate fire protection services.

Policy VIII-4.12: New development shall not be allowed to encroach into high fire hazard areas that are considered to have inadequate fire protection service (i.e., inadequate fire flows, distance from fire station, etc.) that results in the potential for unacceptable fire risk for either the new or existing development in the vicinity.

Policy VIII-4.13: The City should maintain, support and whenever necessary, effect new mutual aid agreements where deemed appropriate to improve fire protection service levels.

GOAL VIII-5: THE CITY SHOULD TAKE APPROPRIATE ACTIONS TO REDUCE AND CONTROL THE USE, GENERATION, STORAGE AND TRANSPORT OF HAZARDOUS MATERIALS, SUBSTANCES AND WASTES, AND TO MINIMIZE ACCIDENTAL EXPOSURE OF HUMANS AND WILDLIFE TO THESE SUBSTANCES.

Hazardous Substances

Policy VIII-5.1: The City should require all businesses located in the City to obtain Business Tenancy Permits and should participate in the safe and efficient regional management of hazardous waste and hazardous materials to protect public health and the environment. This includes implementation of the policies and programs of the City's Hazardous Materials Management Plan and the Ventura County and Incorporated Cities Hazardous Waste Management Plan (the Tanner Plan).

Policy VIII-5.1.1: The City should identify all producers, users, and transporters of hazardous materials substances and wastes within the City and establish a system to monitor the handling, transport, and disposal of such materials, substances and wastes.

Policy VIII-5.1.2: The City should require all businesses, public organizations, and private institutions located in the City to file a list of the chemicals which they use with the Ventura County Fire Protection District, the Simi Valley County Sanitation District, and all other regulatory agencies as required by law and identify the areas where they are used or stored so that, should an emergency arise, emergency personnel will be able to respond appropriately.

Policy VIII-5.1.3: The City, in conjunction with the Ventura County Fire Protection District, should continue to computerize a list of producers, users, and transporters of hazardous materials, substances and wastes within the city.

Policy VIII-5.2: The City should continue implementation and enforcement of the chemical disclosure laws (HSC Sections 25500 et. seq.).

Policy VIII-5.3: The City should attempt to identify existing or previously existing hazardous waste generators or disposal sites.

Policy VIII-5.4: The City should coordinate with the Ventura County Environmental Health Department to encourage monitoring of contamination at sites that have been used for the disposal of hazardous waste. Of special concern are disposal sites that have the potential to adversely affect underground water supplies.

Policy VIII-5.5: The City should arrange for a system to collect hazardous/toxic wastes from residential households on a regular basis.

Policy VIII-5.6: The City should oppose any efforts to re-introduce the disposal of hazardous materials, substances and wastes at the Simi Valley landfill site.

Policy VIII-5.7: The City should coordinate with the Ventura County Fire Protection District and with other agencies that have emergency response obligations regarding the City's role and appropriate actions to be taken in the event of a hazardous material release incident.

Policy VIII-5.8: The City should participate in periodic reviews and updates of the County's hazardous materials incident response plan. This review should be conducted in conjunction with a simultaneous review of the hazardous materials users list compiled and maintained by the Fire Protection District in compliance with chemical disclosure laws.

Policy VIII-5.9: The City should make every reasonable effort to ensure that businesses utilizing hazardous materials in the City should be located in areas which minimize risk to the public or the environment.

Policy VIII-5.10: The City should require all businesses utilizing hazardous materials in the City implement a waste minimization program which includes management measures in the following priority:

1. Source Reduction: Including substitution of less hazardous materials, spill prevention and control measures, proper storage and handling of chemicals and raw materials.

2. Recovery and Reuse: Including on-site recycling and reuse for wastestreams such as: solvents, oils, ethylene glycol, silver, and concentrated bath solutions.

3. Treatment: Including such pretreatment techniques as to render hazardous wastes non-hazardous or suitable for disposal to a public sewer.

Policy VIII-5.11: The City should work cooperatively with other agencies to streamline the permitting process for businesses utilizing hazardous materials.

Policy VIII-5.12: The City should work cooperatively with and actively encourage other agencies to monitor and enforce hazardous material management regulations.

GOAL VIII-6: THE CITY SHOULD ENFORCE LAWS AND PROMOTE POLICIES WHICH ENSURE THE MAXIMUM FEASIBLE SEISMIC STABILITY OF STRUCTURES AND CRITICAL FACILITIES.

Structural Hazards

Policy VIII-6.1: The City should adopt that version of the State Building Code (amended Uniform Building Code) for the zone which provides maximum seismic protection.

Policy VIII-6.2: Emergency communication centers, fire stations, and other emergency service facilities shall be located in earthquake resistant structures.

Policy VIII-6.3: All new water storage facilities in Simi Valley shall be designed to withstand the seismic loading expected at the sites during the maximum credible earthquake event.

Policy VIII-6.4: The City should continue to identify and encourage the rehabilitation of buildings which pose a hazard due to inadequate seismic design as outlined in the City Unreinforced Masonry Ordinance and Government Code Sections 8875, et seq.

Policy VIII-6.5: The Building and Safety Division should maintain its current inventory map of existing unreinforced masonry structures.

Policy VIII-6.6: Priorities for inspection of existing structures and abatement of hazardous structures shall be established.

Policy VIII-6.7: Following an earthquake with significant ground shaking effects in Simi Valley, Building and Safety officials or a registered structural engineer should inspect critical facilities and structures meant for human occupancy for landslides and structural damage. Areas of potential unstable ground, landslide areas or slopes should be inspected by a registered geologist or geotechnical engineer. Potentially unstable structures or ground and potential landslide areas should be identified and stabilized.

Policy VIII-6.8: Priorities should be established during the post-earthquake response activity for inspection of structures or unstable ground areas following an earthquake and abatement of structural or unstable ground hazards.

Policy VIII-6.9: Priorities for post-earthquake reconstruction shall be established as an integral component of the post-earthquake response activity.

Policy VIII-6.10: At the discretion of the Building Official, the City should require that a site-specific assessment of potential ground shaking be performed for new major developments and critical structures.

Policy VIII-6.11: New critical service structures shall not be located wherever potential geologic/seismic hazards may result in unacceptable damage to the structures.

GOAL VIII-7: THE CITY SHOULD IMPLEMENT PROGRAMS AND ACTIONS THAT WILL PROMOTE THE ADEQUATE PROVISION OF EMERGENCY SERVICES DURING OR FOLLOWING A NATURAL OR HUMAN CAUSED EMERGENCY.

Emergency Response

Policy VIII-7.1: The City should continue to maintain and update as needed a comprehensive emergency plan consisting of measures to be taken during and after an earthquake, flood, toxic/hazardous spill, fire or other disaster.

Policy VIII-7.2: The City should continue to maintain an updated list of personnel and equipment qualified to provide assistance during a disaster.

Policy VIII-7.3: The City should continue to familiarize City staff with the basic recommendations of the Emergency Preparedness and Evacuation Plan.

Policy VIII-7.4: The City should continue to conduct disaster training programs for staff and community volunteers to assist police, fire, and civil defense personnel.

Policy VIII-7.5: The City should explore the potential for north/south evacuation routes for major new developments to the north and south of the city.

GOAL VIII-8: THE CITY SHOULD IMPLEMENT PROGRAMS AND ACTIONS THAT WILL PROMOTE PUBLIC HEALTH AND REDUCE THE INCIDENTS OF CRIME.

Public Health

Policy VIII-8.1: New development shall use community sewer facilities and shall only be permitted as the capacity of those community sewers and sewage treatment facilities allows.

Policy VIII-8.2: In rural development, individual sewage disposal systems may be permitted in accordance with the Uniform Plumbing Code. In such cases, the geology of the lots shall be satisfactory and the size of proposed lots which may be approved for development shall be large enough that the health and welfare conditions of the surrounding area are not adversely affected.

Policy VIII-8.3: The extension of sewer facilities shall be encouraged to upgrade service as needed in existing neighborhoods without any or with inadequate existing facilities.

Policy VIII-8.4: The City shall encourage the protection and maintenance of high quality, groundwater resources.

Crime Prevention

Policy VIII-8.5: Development should be designed according to the following criteria:

Policy VIII-8.5.1: The arrangement of buildings, access, outdoor lighting and landscaping should facilitate police protection and ensure resident security. Doors, windows and hardware shall meet minimum burglar-resistant standards.

Policy VIII-8.5.2: Visible curbside street numbers or directory maps should be provided adjacent to each new or existing commercial, industrial, or residential location throughout the City and should be visible at night for the necessary convenience of the public and the provision of the optimum response of safety services.

Policy VIII-8.5.3: The City should encourage Neighborhood Watch and other similar public-involvement, crime-prevention programs.

8.4 IMPLEMENTATION MEASURES

The Safety Element of the Simi Valley General Plan contains Hazards Maps which designate known areas of risk which represent the potential for damage to property, or loss of life or vital services. These hazards include the risk of wildfire, flooding, dam inundation, and seismically-related hazards, including liquefaction, subsidence, ground shaking, and slope failure.

The implementation measures and hazard maps, along with the Land Use Map, assist in realizing the goals and policies of the Safety Element. The Land Use Map acts as a physical implementation tool and the following implementation measures as programs or ordinance implementation tools. Measures that are intended to implement each of the safety element policies are identified on Table 8-1.

PROTECTION AND HAZARD AVOIDANCE

VIII-A The development review process shall ensure that all projects comply with federal, state, and local health, safety, and environmental laws.

VIII-B The development review process, environmental review, and the hazards maps included in this element shall be used to avoid unnecessary risk to public health and safety in new development.

VIII-C The City, through the development review process, should require any development located within identified high hazard areas to demonstrate that adequate mitigation measures can reduce potential hazard impacts to an acceptable level prior to project approval.

VIII-D When necessary, applicants for development shall be required to submit detailed soils, hydrologic, geologic, and other environmental analyses and demonstrate that the design and engineering of the projects are adequate to ensure public safety.

VIII-E The City should adopt a transfer of development rights (TDR) ordinance to facilitate the transfer of development rights out of areas with a high risk of natural or man-caused disaster.

Geologic-Seismic Hazards

VIII-F The City should develop a set of written guidelines for the geologic-seismic investigation required prior to development within 50 feet of the Simi-Santa Rosa, Santa Susana, or other active or potentially active faults.

VIII-G The city should develop and adopt an ordinance specifying the required setbacks of development from the Simi-Santa Rosa, Santa Susana, or other active or potentially active faults. The ordinance should outline hazard zones around faults that have potential for ground surface rupture and should outline specific restrictions on development in these zones.

VIII-H All geologic-seismic reports submitted to the City for review shall be prepared by registered soils engineers, geologists, structural engineer, or other appropriate discipline.

VIII-I Geologic-seismic investigations shall include review of available literature pertinent to the site, including soils/geologic studies and aerial photographs.

VIII-J When conducting required geologic-seismic investigations, a minimum of one trench shall be excavated roughly perpendicular to the anticipated fault trend. The trench should extend a sufficient distance on either side of the estimated fault location to allow for uncertainties in the fault location and to detect splay faults, if present.

VIII-K Geologic-seismic investigation trenches shall extend to a depth below Holocene alluvium into Pleistocene or older deposits if possible. Trenches across the Simi-Santa Rosa fault may be required to extend to depths of 25 to 35 feet.

VIII-L Alternative subsurface exploration programs may be acceptable such as downhole logged rotary bucket auger borings or geophysical exploration techniques with prior approval by the City Engineer.

VIII-M As part of any required geologic-seismic investigation, an effort should be made to date the time of latest movement if faults or fault related deformation is encountered.

VIII-N Geologic-seismic investigation reports shall contain conclusions as to the potential risk of ground surface rupture at the site in question.

VIII-O Structures not intended for human occupancy and designed to mitigate potential deformation of the structure may be constructed within 20 feet of a fault with ground surface rupture potential, contingent on approval from the City Engineer.

VIII-P No new critical facilities shall be built within 100 feet of the demonstrated location of an active or potentially active fault.

VIII-Q Construction of new structures or additions to existing structures meant for human occupancy within 50 feet of a fault with ground rupture potential shall not be permitted.

VIII-R Construction of additions to existing critical facilities within 100 feet of a fault with ground rupture potential shall not be permitted.

VIII-S The City should encourage additional geologic and seismic investigations within the City by federal, state, and local agencies and organizations.

VIII-T The City should continue to cooperate with state officials regarding on-going studies relating to the Simi-Santa Rosa and Santa Susana Faults.

VIII-U The Safety Element and policies should be reviewed and comprehensively revised whenever substantially new scientific evidence becomes available, regarding seismic and geologic hazards.

Slope and Ground Stability Hazards

VIII-V The City should enforce the Hillside Performance Standards.

VIII-W The City should continue to utilize the most current version of Chapters 29 and 70 of the Uniform Building Code and Chapter 6 and 7 of the Ventura County Land Development Manual to ensure the application of current state-of-the-practice grading and drainage policies.

VIII-X Information obtained from studies of significant landslides that cause damage to structures or public improvements shall be made available to the general public for future use.

VIII-Y After a major earthquake, the City should conduct inspections of hillside areas near occupied structures to identify any potential landslides that could be triggered by aftershocks.

VIII-Z A geotechnical report by a registered geotechnical engineer should be required by the City for developments within potential slope and ground stability hazard zones. The report should assess the extent of the hazard and should recommend possible mitigation measures.

VIII-AA Soils and geologic reports for hillside construction shall be prepared as required by the Hillside Performance Standards and shall be submitted to the City Engineer. These reports may be reviewed for adequacy by appropriate consultants selected by the City at the applicant's expense.

VIII-BB Applicable drainage, grading, site design, and landscaping requirements contained in the City's Hillside Performance Standards shall be applied to all new hillside development.

VIII-CC The type, location, and intensity of new development in areas prone to slope instability and erosion shall be determined by the Hillside Performance Standards and the results of site specific engineering geology studies.

VIII-DD The City should create and update a data base of identified slope and ground stability hazards. Data from site specific geology or geotechnical studies would be entered into the data base and the site location and identified hazard would be plotted on a map. This information shall be made available to the public.

VIII-EE The City should consider assisting developers with the formation of Geologic Hazard Abatement Districts in areas subject to significant slope and ground stability hazards.

Water-Related Hazards

VIII-FF All new developments shall be designed in accordance with the "Drainage Study Guidelines."

VIII-GG The City should enforce the City's Flood Damage Prevention Ordinance (Chapter 5 of Title 7, SVMC), in relation to adopted FIRM maps, which address land uses in areas subject to inundation by a 100-year flood.

VIII-HH Continue the City's participation in the Federal Emergency Management Agency's National Flood Insurance Program.

VIII-II Drainage facilities for developments shall be designed so that vehicle and pedestrian use of roads is not unreasonably restricted, and road improvements and adjacent properties are not severely damaged in the event of a flood.

VIII-JJ The City of Simi Valley should maintain and update as needed the Master Plan of Drainage. The Plan shall identify needed drainage facilities, including any major storm-water detention facilities that may be required. New development shall comply with provisions of the Master Plan of Drainage.

VIII-KK The City should cooperate with the Ventura County Flood Control District to identify and mitigate potential flood plain hazards such as inadequate flood control channels, loose unanchored structures and objects located on flood plains, and illegal dumping in drainage channels.

VIII-LL Flood control channel improvements shall, whenever feasible, incorporate the use of environmental and aesthetic design treatments, such as the use of riprap, gabion baskets, etc. The use of open concrete channels, particularly in urbanized areas, should be discouraged.

VIII-MM The City should encourage county and state officials to complete, review, and approve the inundation map and emergency evacuation plan for the Las Llajas Dam as required by Code 8589.5 of the State Emergency Services Act.

VIII-NN The City should adopt an ordinance outlining the type and density of new development in potential dam inundation areas.

VIII-OO Dam inundation maps should be revised as new development occurs in Simi Valley.

VIII-PP For proposed new dams, which fall under the jurisdiction of the State Division of Dam Safety, the effects downstream of potential inundation due to dam failure should be studied prior to construction of the dam.

Fire Related Hazards

VIII-QQ The City should enforce fire prevention ordinances outlining requirements for fire sprinklers, roofing material, and smoke detectors, and shall encourage the Fire Protection District to enforce weed/brush abatement ordinances.

VIII-RR The City should continue to prohibit wood roofing material in areas of high fire hazard and non-pressure treated shake roofs in other areas.

VIII-SS The City should develop and adopt fire hazards ordinances outlining minimum road width and access requirements and minimum fire flow requirements.

VIII-TT The City should encourage the Fire Protection District to continue to support programs to reduce fire hazards from certain vegetation in areas of high fire risk, such as weed and brush removal and control, use of fire resistant plantings, and the maintenance of appropriate firebreaks.

VIII-UU The City should cooperate with the Ventura County Fire Protection District in construction of helispot locations in developments in high fire hazard areas.

VIII-VV The City should continue to require applicants of complex developments to retain a consultant to develop a fire protection plan for the proposed project. Complex developments include, but are not limited to: development with private internal circulation systems, located in difficult access areas, high fire hazard areas, or other conditions that have the potential to restrict or hamper fire suppression activities.

VIII-WW The Police Department should continue to administer a permit program to limit the use of off-road vehicles in high fire hazard areas.

VIII-XX The City should make provisions to provide adequate fire protection services. As a result of the lack of fire facilities and money to provide these facilities in areas of new development, the City should support the requirements for Fire Protection Facility Fees for new construction.

VIII-YY The City should encourage the county to adopt a priority schedule to conduct structural modifications to the fire stations 43, 45, and 46, which are considered to be in most need of structural modifications.

VIII-ZZ As a part of the design review process, the City and the Fire Protection District should review and evaluate proposed land uses for their vulnerability for fire and accessibility during emergencies.

VIII-AAA The City should encourage the Fire Protection District to develop written guidelines for developments in high fire hazard hillside and canyon areas addressing additional/special requirements for sprinklers, vegetation clearance, and fire flows.

VIII-BBB The City should cooperate with the Ventura County Fire Protection District's Fire Prevention Bureau in reviewing all applications for new development in the Hillside/Canyon areas to assess potential impacts to existing fire protection services.

VIII-CCC New subdivisions in the Hillside/Canyon areas of the City shall be designed to facilitate brush clearance around structures without undue hardship or expense.

VIII-DDD The City should establish a priority list to be included in the Capital Improvement Plan for upgrading fire flow capabilities in neighborhoods that currently have inadequate fire flows.

VIII-EEE The City should encourage the Fire Protection District to maintain existing mutual aid agreements with nearby cities and counties to provide emergency response services.

Hazardous Substances

VIII-FFF The City should implement the policies and programs of the Ventura County and incorporated cities Hazardous Waste Management Plan (the Tanner Plan).

VIII-GGG The City should implement the Hazardous Materials Plan and Ordinance to assure that all businesses producing, using and/or transporting hazardous materials and/or waste are in compliance with federal, state, and local laws and are in compliance with requirements of other agencies.

VIII-HHH The City's Hazardous Materials Plan should map the distribution of hazardous materials- and/or waste-related businesses and the type of chemicals being used.

VIII-III The City should establish a system to monitor and regulate the handling, transport, storage, and disposal of hazardous materials, substances and wastes.

VIII-JJJ The City should gather and review data regarding contamination at sites that have been used for the disposal of hazardous waste. Of special concern are disposal sites that have the potential to adversely affect underground water supplies.

VIII-KKK The City should promote and organize periodic neighborhood collections of household hazardous materials.

VIII-LLL The City shall provide educational programs regarding the proper use and disposal of hazardous substances. The City shall also closely study any action intended to resume hazardous waste disposal operations at the Simi Valley Landfill, and make appropriate recommendations to the County of Ventura.

VIII-MMM The City shall promote the routing of vehicles carrying hazardous materials along transportation corridors that reduce public exposure to risk including the railroad and State Route 118.

VIII-NNN The City should review options and assess the costs of providing access to a computerized list of hazardous materials/waste sites via computer terminals in the Department of Environmental Services, Police Department, and Department of Public Works, to assure that these departments have an up-to-date list of hazardous materials and waste sites.

VIII-OOO The City should continue participation in County and State-wide planning efforts regarding the reduction of hazardous waste generation, enforcement of regulations regarding the use, storage, transportation and disposal of hazardous substances and responses to hazardous substance release incidents.

VIII-PPP The City should maintain a cost recovery system for the Police Department, Public Works and other City departments involved in emergency response to hazardous substance leaks or spills. The City should assess the costs against the responsible party on a time and materials basis.

VIII-QQQ The City should make operational the Business Tenancy Certificate Ordinance.

VIII-RRR The City should assess the relative risk of its commercial and industrial zones and encourage businesses utilizing hazardous materials to locate in lower risk areas. Modifications of the Zoning Ordinance should be utilized to implement the results of this risk assessment.

VIII-SSS The City should develop procedures to refer businesses to other agencies regulating hazardous materials and to refer other regulatory agencies to potential users of hazardous materials.

VIII-TTT The City should negotiate memoranda of understanding with other regulatory agencies to streamline the permit process for business utilizing hazardous materials.

VIII-UUU The City should provide technical assistance in product substitution, regulatory compliance, product recycling, and emergency response and should develop cooperative training programs for the business community.

VIII-VVV The City should modify its CEQA Initial Study form to seek disclosure of hazardous material use or hazardous waste generation.

VIII-WWW The City should develop procedures to refer monitoring and enforcement actions to other regulatory agencies and monitor responses by these agencies. The City should also develop memoranda of understanding to perform joint inspections with these agencies.

VIII-XXX The City should develop procedures to direct citizen referrals of hazardous material problems to a hazardous material program coordinator who will monitor the response to these referrals by the City and other agencies.

VIII-YYY The City, in cooperation with the Hazardous Incident Response Team, should continue to develop procedures and provide training to City personnel to minimize emergency response time to uncontrolled releases of hazardous materials and to facilitate the dissemination of information to the public.

VIII-ZZZ The City should continue to provide public education programs for the general public and business community to foster greater understanding of the City's policies regarding hazardous materials management, the responsibilities of the business community, and the proper response to hazardous materials incidents.

Structural Hazards

VIII-AAAA The City should continue to adopt and use the most current version of the State Building Code (amended Uniform Building Code). Design provisions should be adopted which are as stringent or more stringent than required for the zone of maximum expected ground shaking (Zone 4).

VIII-BBBB Prior to siting new critical facilities, site specific geologic investigations shall be performed to assess potential groundshaking and other geologic impacts and to recommend measures, if feasible, to reduce identified seismic and geologic process risk.

VIII-CCCC All new water storage facilities in Simi Valley shall be designed to withstand the seismic loading for the area as recommended by the American Water Works Association.

VIII-DDDD The City should implement the steps necessary to maintain the existing inventory of unreinforced masonry buildings within the City of Simi Valley. From this list, priorities should be established for the inspection and abatement of structural hazards. The preservation and rehabilitation of structures should be encouraged.

VIII-EEEE The City should devise a plan and priorities for post-earthquake inspection of structures, soil foundations, and slopes to assess damage, potential hazards, and reconstruction needs.

Emergency Response

VIII-FFFF The City should continue to develop, maintain, and update as necessary the Emergency Response and Evacuation Plan that addresses structural hazards, inundation from dam failure, seismic activity, flooding, fire, hazardous material/toxic spill, and other disasters. This plan shall also outline measures to be taken during and after a disaster, personnel and equipment qualified to provide assistance, and shall be revised as new information becomes available.

VIII-GGGG The City should continue to hold periodic meetings to familiarize City staff with the Emergency Preparedness and Evacuation Plan.

VIII-HHHH The City should continue to sponsor public emergency preparedness and disaster-related education and training courses.

VIII-IIII Where feasible, the City should require evacuation routes for major new developments in the city.

Public Health

VIII-JJJJ Except where individual sewage disposal systems are permitted, the City should require new development to use community sewer facilities. New development shall only be permitted as the capacity of those community sewers and sewage treatment facilities allows.

VIII-KKKK In cases where individual sewage disposal systems are permitted, the City should require geologic studies to ensure that the groundwater is not contaminated and that the lots are large enough and that the health and welfare conditions of the surrounding area are not adversely affected.

VIII-LLLL The City should encourage the extension of sewer facilities to upgrade service in existing neighborhoods currently unsewered or with inadequate facilities.

VIII-MMMM The City should encourage the protection and maintenance of high-quality groundwater resources through water quality monitoring and other acceptable means.

Crime Prevention

VIII-NNNN The City's Building and Security Ordinance should continue to be applied to regulate the security of structures and their sites.

VIII-OOOO The Police Department should review the design of proposed projects (architecture and lighting) to minimize crime.

VIII-PPPP The Police Department should cooperate and work with Neighborhood Watch and other similar public involvement programs.

Table 8-1. Policy/Implementation Table Safety Element

POLICY	APPLICABLE IMPLEMENTATION MEASURES
Protection and Hazardous Avoidance	
VIII-1.1	A, S, T, W, GG, HH, KK, MM, PP, TT, UU, FFF, GGG, LLL, OOO
VIII-1.2	B, E, G, O, P, Q, R, OO, CCC, HHH, RRR
VIII-1.3	C, D, H, Z, AA, CC, EE, II, JJ, KK, RR, SS, TT, CCC, AAAA
VIII-1.4	A, D, Z, CC, FF, II, JJ, KK, OO, PP, BBB, DDD, RRR
Geologic-Seismic Hazards	
VIII-1.5	F, G, O, S, T, U, V, AA, BB
VIII-1.6	F, H, I, J, K, L, M, N, Z, AA, CC
VIII-1.7	U
VIII-1.8	F, G, H, I, J, K, L, M, N
VIII-1.9	F, O, P, Q, R
VIII-1.10	B, C, D
VIII-1.11	W
VIII-1.12	D, H, I
Slope and Ground Stability Hazards	
VIII-2.1	Z, AA, BB, CC
VIII-2.2	X, DD
VIII-2.3	Y
Water-Related Hazards	
VIII-3.1	GG, II, JJ, KK
VIII-3.2	GG, II
VIII-3.3	JJ

Table 8-1. (Continued)

POLICY	APPLICABLE IMPLEMENTATION MEASURES
Water-Related Hazards (con't)	
VIII-3.4	II, JJ
VIII-3.5	LL
VIII-3.6	MM, NN, OO, PP
VIII-3.7	NN, OO
Fire-Related Hazards	
VIII-4.1	QQ
VIII-4.2	RR, TT, ZZ, AAA, BBB, CCC
VIII-4.3	QQ, RR
VIII-4.4	QQ, TT, AAA, CCC
VIII-4.5	XX, BBB, DDD
VIII-4.6	VV
VIII-4.7	QQ, TT, AAA
VIII-4.8	WW
VIII-4.9	ZZ
VIII-4.10	SS, VV, ZZ
VIII-4.11	UU, XX, YY, ZZ
VIII-4.12	ZZ, AAA, BBB
VIII-4.13	EEE
Hazardous Substances	
VIII-5.1	FFF, HHH, III, KKK, NNN
VIII-5.2	GGG, III, MMM, XXX
VIII-5.3	HHH, FFF, VVV
VIII-5.4	JJJ, SSS, WWW

Table 8-1. (Continued)

POLICY	APPLICABLE IMPLEMENTATION MEASURES
VIII-5.5	GGG
VIII-5.6	LLL
VIII-5.7	PPP, YYY
VIII-5.8	KKK, VVV, ZZZ
VIII-5.9	QQQ
III-5.10	GGG, III, QQQ, RRR
VIII-5.11	FFF, OOO, UUU, ZZZ
VIII-5.12	TTT
VIII-5.13	KKK, SSS, TTT, WWW, XXX
Structural Hazards	
VIII-6.1	AAAA
VIII-6.2	BBBB
VIII-6.3	CCCC
VIII-6.4	DDDD
VIII-6.5	DDDD
VIII-6.6	DDDD
VIII-6.7	EEEE
VIII-6.8	EEEE
VIII-6.9	EEEE
VIII-6.10	BBBB
VIII-6.11	BBBB

Table 8-1. (Continued)

POLICY	APPLICABLE IMPLEMENTATION MEASURES
Emergency Response	
VIII-7.1	FFFF
VIII-7.2	FFFF
VIII-7.3	GGGG
VIII-7.4	HHHH
VIII-7.5	IIII
Public Health/Crime Prevention	
VIII-8.1	JJJJ, LLLL
VIII-8.2	MMMM
VIII-8.3	NNNN
VIII-8.4	MMMM
VIII-8.5	NNNN, OOOO, PPPP

FINAL SAFETY ELEMENT
CITY OF SIMI VALLEY

*   *   *

TECHNICAL APPENDIX J

SAFETY ELEMENT
TECHNICAL APPENDIX J

TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

LIST OF FIGURES

LIST OF ILLUSTRATIONS - Continued

LIST OF TABLES

APPENDICES

I. GEOLOGIC SETTING

A. REGIONAL GEOLOGY

Simi Valley is within the Transverse Ranges geomorphic province of southern California. The province is characterized by an east-west trending sequence of ridges and valleys formed by a combination of folding and faulting during a period of compression and uplift. Simi Valley is bounded to the north and east by Big Mountain and the Santa Susana Mountains and to the south by the Simi Hills (Figure 1).

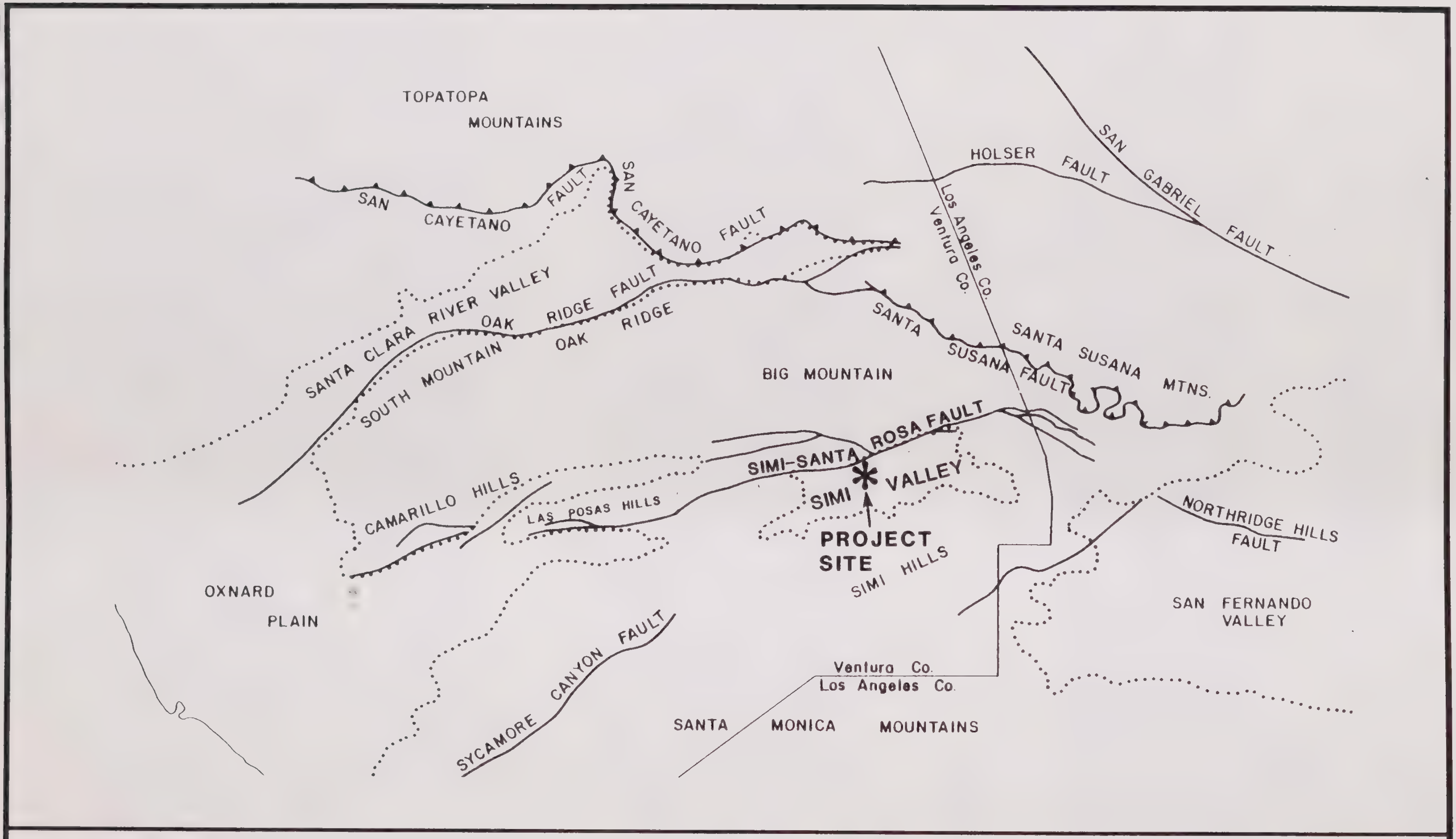
B. LOCAL GEOLOGY

1. Structure

A complex geologic history including folding, faulting, tilting, volcanism, erosion, and deposition has resulted in the present Simi Valley landscape. As seen on Figures 2a, b and c, most of the City of Simi Valley is within a broad depression or syncline that plunges to the west. Just north of the city is the Simi Anticline, an east-west trending regional fold in the foothills of the Santa Susana Mountains. The Simi fault and associated fault-line scarp form the topographic boundary between the valley and the foothills. Figure 3 shows a schematic cross section across the area.

2. Geologic Materials

The Simi Valley has accumulated over 500 feet of alluvial sediments derived from erosion of the surrounding hills and mountains. Younger alluvium is present on the valley floor as well as in the canyons that drain into the valley. Older alluvium is exposed along the margins of the valley and in the hills near the Oak Park and Canada de la Brea oil fields (Hanson, 1981). Higher elevations are underlain predominantly by bedrock of the Tertiary-age Santa Susana, Llajas, and Sespe formations. Conejo volcanics are exposed in portions of western Simi Valley, whereas the eastern end of the valley is dominated by the Cretaceous-age Chatsworth Formation. Table 1 summarizes the characteristics of the geologic materials found in the Simi Valley area. Figure 4 presents the stratigraphic column for the area.



Source: Hanson, 1981

Figure 1

TECTONIC MAP OF SIMI VALLEY AND SURROUNDING AREA (Central Transverse Ranges)

McClelland consultants

J-1.2

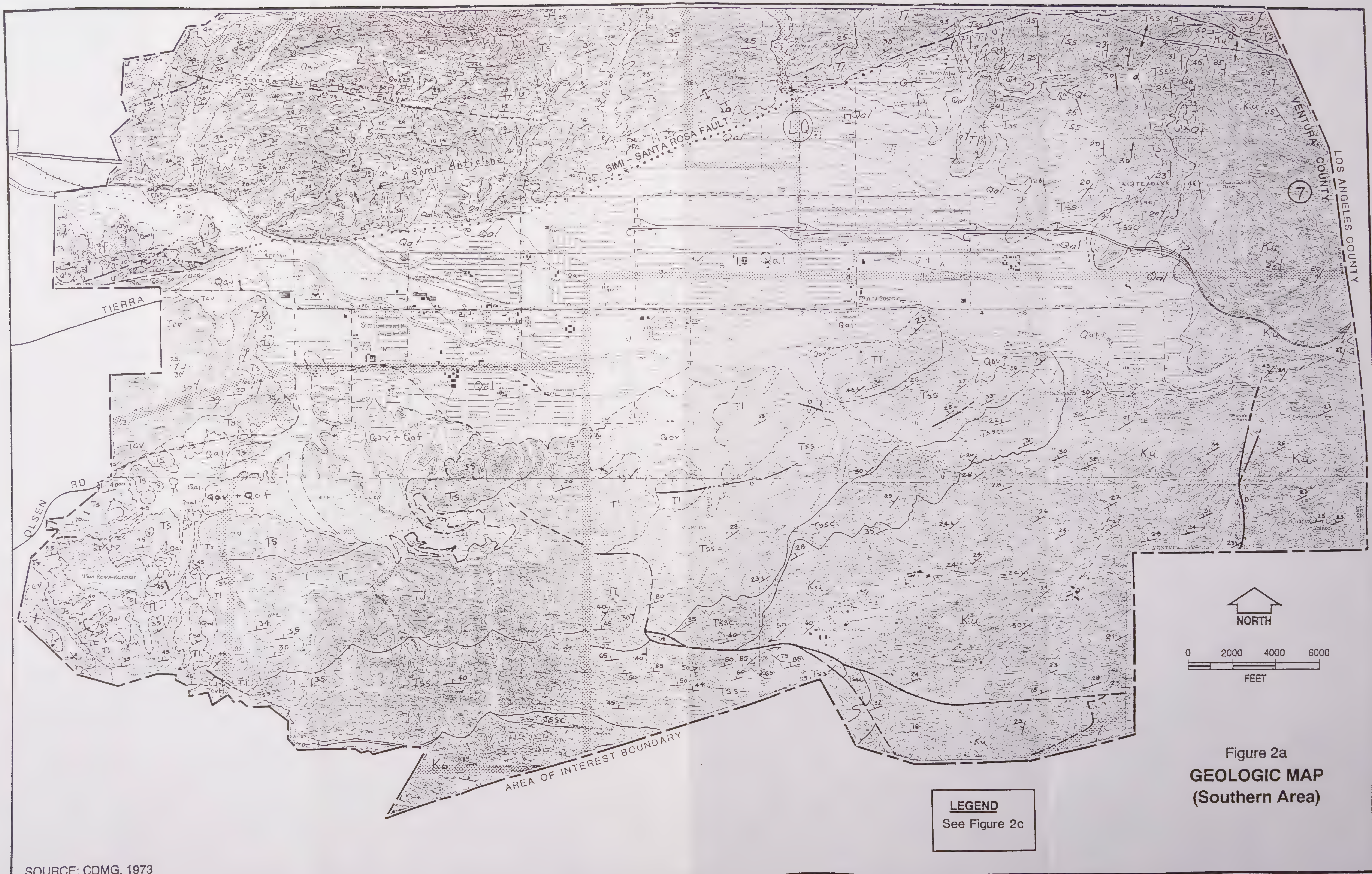


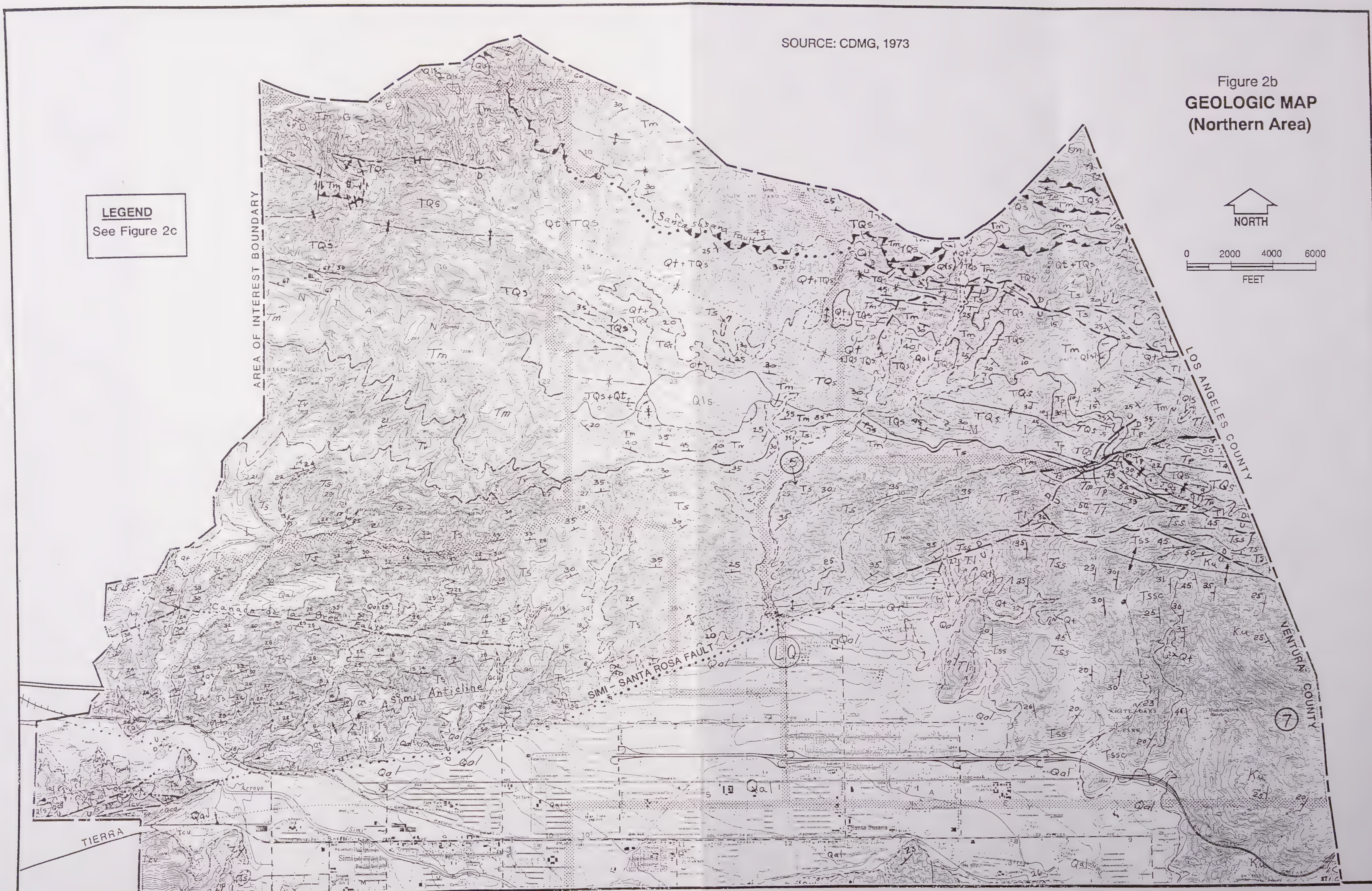
Figure 2a
GEOLOGIC MAP
(Southern Area)

SOURCE: CDMG, 1973

SOURCE: CDMG, 1973

Figure 2b

GEOLOGIC MAP
(Northern Area)



McClelland consultants.

EXPLANATION - ROCK UNITS

QUATERNARY

HOLOCENE

af — artificial fill

Qbs — Beach and dune sand deposits.

Landslides (see below)

PLEISTOCENE — UPPER

Qal — Younger alluvium, undifferentiated. Where differentiated, includes following varieties:

Qsc — Stream channel deposits; sand and gravel.

Qd — Deltaic deposits, Oxnard plain; clayey to silty sand.

Qfp — Flood plain deposits; sand and gravel.

Ql — Lagoonal deposits, Oxnard plain; clayey to silty deposits.

Qvf — Valley fill deposits; mostly sand to sand and gravel.

Qf — Alluvial fan deposits; mostly coarse sand and gravel.

Qco — Colluvium and slopewash; clayey to pebbly silt and sand.

Qs — Spring deposits; calcium carbonate (Fillmore area).

Offshore area (2)
(Submarine sediments of Quaternary age)

Qcfs — Submarine canyon fill.

Qlss — Submarine landslides.

Qhs — Holocene marine deposits.

Qps — Upper Pleistocene deposits.

TQts — Buried marine terrace deposits (Late Tertiary and Quaternary in age).

Qoal — Older, dissected and/or uplifted alluvium. Where differentiated, includes following varieties:

Qt — Marine and nonmarine terrace deposits; sand and gravel.

Qod — Older lacustrine and deltaic deposits; silty to pebbly sand. (point localities)

Qof — Older alluvial fan deposits, mostly coarse sand and gravel.

Qos — Older stream channel deposits; sand and gravel.

Qov — Older valley fill and floodplain deposits; sand to sand and gravel.

Landslides
(Upper Quaternary to present).

Qls

LOWER TO MIDDLE

TQc — Casitas Formation (nonmarine); mostly sand and gravel. west edge — west and central

TQsp — San Pedro Formation (upper part nonmarine; lower part marine); sandstone and conglomerate. Includes Santa Barbara Fm. in Grimes Canyon area.

TQsb — Santa Barbara Formation (marine); ranges mostly from mudstone to sandstone in west, and from sandstone to conglomerate in east-central region. Included with San Pedro Fm., Grimes Canyon area.

TERTIARY

PLIOCENE

Tp — Pico Formation (marine); in west consists of shale and siltstone, and lesser sandstone and conglomerate; in east consists mostly of sandstone, along with conglomerate and shale.

MIOCENE

Tsm — Santa Margarita Formation (marine); shale and sandstone. west — east

Tto — Towsley Formation (marine); sandstone with conglomerate.

Tm — Monterey Formation (to west) and Modelo Formation (to east), undifferentiated; marine; clay shale, diatomaceous shale, and other sedimentary rocks.

Tmb — "Burnt shale" of Monterey and Modelo Formations.

Tr — Rincon Formation (marine); shale. west — east

Tt — Topanga Formation (marine); mostly sandstone and conglomerate.

Tcv — Conejo and other volcanics, undivided; mostly middle Miocene in age; where divided, include following varieties:

Tcvb — Basalt to andesite; flows to volcanic sedimentary rocks.

Tcvi — Basalt to andesite; intrusive.

Tcva — Andesite to dacite; flows to volcanic sedimentary rocks.

Tv — Vaqueros Formation (marine); sandstone.

OLIGOCENE

Ts — Sespe Formation (nonmarine); clayey to pebbly sandstone and siltstone.

EOCENE

Eocene rocks north of San Cayetano fault and Ojai Valley.

Tc — Coldwater Formation (marine); sandstone.

Tco — Cozy Dell Formation (marine); shale

Tma — Matilija Formation (marine); sandstone

Tj — Juncal Formation (marine); shale and sandstone.

Cretaceous to Eocene rocks of Simi Hills and Simi Valley areas

Tl — Llajas Formation (marine); sandstone and siltstone.

PALEOCENE

Tss — Santa Susana Formation (marine); sandstone and conglomerate.

Tssc — (Tssc; basal, Simi conglomerate).

UPPER CRETACEOUS

Ku — Unnamed, informally called "Chico Formation"; marine; mostly sandstone.

EXPLANATION - SYMBOLS

Faults

Positively identified and accurately located.

Relatively well-identified and/or relatively accurately located.

Conjectural or inferred and/or approximately located.

Concealed; conjectural where queried. Faults in areas of offshore submarine sediments are surmised to be concealed.

Suggested trace as identified on aerial photos, but not verified.

Dip of fault. Relative direction of displacement. U, up; D, down.

"Tooth" symbol used in some map sources denotes thrust fault; teeth are drawn on the upper plate, down-dip side of fault.

Contacts between rock units

Positively identified and accurately located.

Relatively well-identified and/or relatively accurately located.

Approximately located.

Conjectural or surmised.

Concealed; conjectural where queried.

Dip and strike of bedding

25 Normal, showing dip.

25 Normal, approximate.

Normal showing direction of dip.

35 Overturned.

Strike of vertical beds.

Horizontal.

50 Attitude of flow-banding in volcanic rocks.

Area of known historic subsidence of land.

Rockfalls.

Locality described in text.

Mappable beds

Conglomerate

Sandstone

Volcanic dike

Folds

Anticline, showing plunge; dotted where concealed.

Syncline, showing plunge; dotted where concealed.

Overturned anticline, dotted where concealed.

Overturned syncline, dotted where concealed.

Boundaries of data sources (mapping generally not resolved between areas)

Miscellaneous

LQ — Geologic and physiographic evidence suggests that most recent faulting at locality specified is late Quaternary in age.

LS — Denotes that landsliding is widespread in area where symbol is located. See plate 5 for detailed air-photo reconnaissance of landsliding in Southern Ventura County.

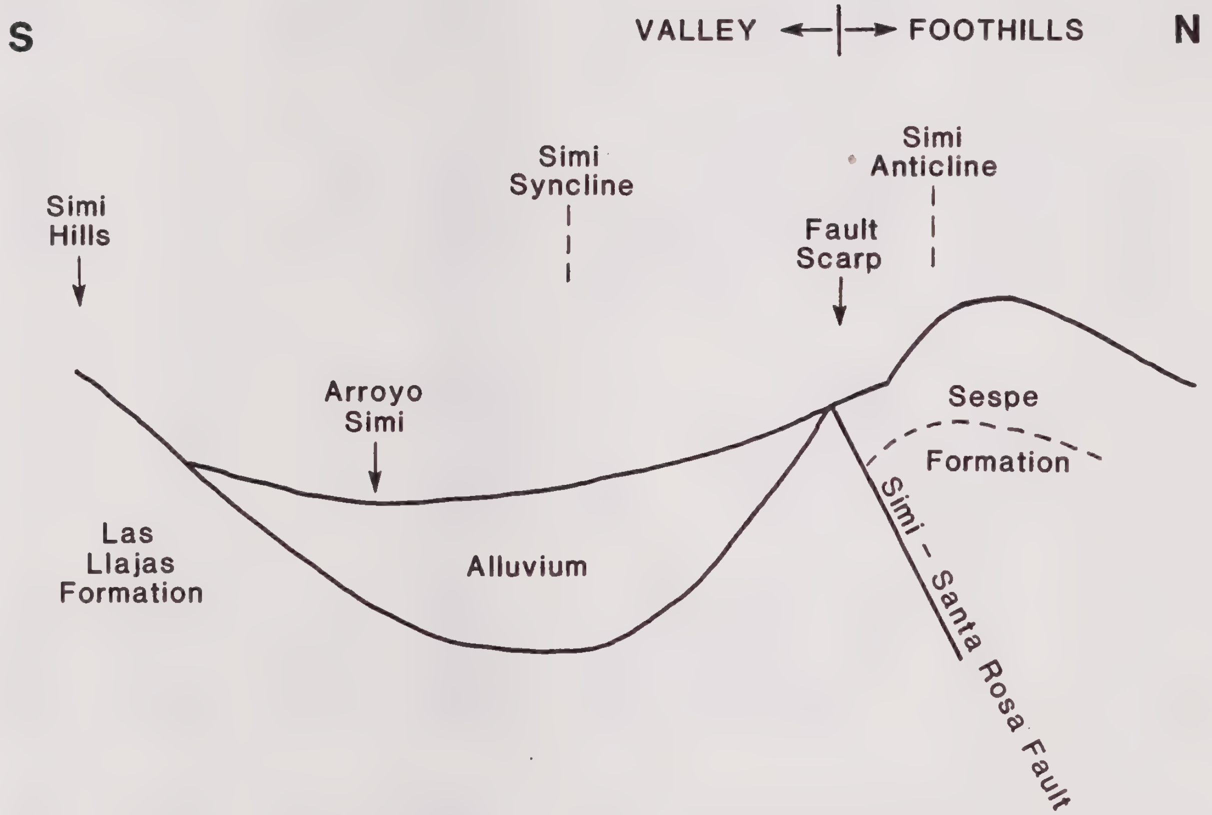
FCA — Indicates that Fox Canyon aquifer is exposed in area; this aquifer consists of lower part of San Pedro – Saugus Fms.

GCA — Indicates that Grimes Canyon aquifer is exposed in area; this aquifer consists of upper part of Santa Barbara Fm. in Grimes Canyon area; where the formation is included with the San Pedro Fm.

OXA — Oxnard aquifer is exposed within area shown as Qfp.

Figure 2c
KEY TO GEOLOGIC MAPS

SOURCE: CDMG, 1973



Based on Hanson, 1981

Not To Scale

Figure 3

SCHEMATIC CROSS SECTION
Simi Valley Area

Table 1. Characteristics of Geologic Materials in the Simi Valley Area

Stratigraphic Unit	Lithology[1]	Topographic Expression[2]	Slope Stability[2]	Soil Development and Problems[2]	Excavation Characteristics[2]	Seismic Response[2]	Mineral Deposits[2]	Hydrology[2]
Upper Cretaceous (Chico)	Light gray, fine to medium-grained sandstone with abundant mica and kaolinite and occasional interbeds of mudstone	Very steep and rugged; outcrops are blocky with well developed joint sets	Stable; some bedding plane failures; rockslides and rockfalls due to joints	Shallow, pebbly silty sand	Rippability is moderate to extremely difficult; blasting may be required	Rockfalls, rockslides, boulder roll	Some nickel and copper; crushed/broken stone	Low permeability
Simi Conglomerate	Lower, non-marine conglomerate with interbeds of sandstone and upper, tan to white arkosic sandstone and olive gray siltstone	Resistant strike-ridges and ridge caps	Stable; some bedding plane failures; rilling and raveling in cut slopes		Rippable with difficulty; blasting may be required	Rockfalls; raveling	Sand and gravel source	Water bearing locally
Marine Paleocene Unit (Las Virgenes Sandstone)	Brown, medium-grained fossiliferous sandstone and conglomeritic sandstone							
Santa Susanna Formation	Massive, blue-gray siltstone beds; sandier toward top of formation; lenticular dark gray limestone in upper part; base is pebble conglomerate	Sandstone forms resistant strike-ridges and ridge caps; siltstones develop gently to moderately steep, grass covered slopes	Bedding plane failures; rilling; small scale slumping on steep slopes	Shallow sandy soil on sandstone; moderately expansive soil on siltstone and claystone	Rippability is moderate to very difficult; blasting may be required	Rockfalls; slumping; rockslides	May contain petroleum	Water bearing locally
Llajas Formation	Basal conglomerate overlain by light brown to gray siltstone, sandy siltstone, fine-grained sandstone	Very steep and rugged; massive outcrops; conglomerate forms ridge caps	Landslides on dip slopes and very steep slopes	Thin sandy soil; locally expansive	Rippability is easy to extremely difficult	Rockfalls; rockslides; slumps	Petroleum	Locally water bearing
Sespe Formation	Lower Member: Yellow sandstone and siltstone with lenses of pebble to cobble conglomerate Upper Member: Alternating white sandstone and green to red siltstone and claystone	Steep, rugged slopes in resistant units; moderately subdued in fine-grained units	Landslides common; bedding-plane failure and large scale rotational failures on steep slopes; cut slopes rill, ravel, and slump	Silty sand and sandy clay; clays are expansive and subject to slump	Rippable with heavy equipment	Landslides; rockslides	Petroleum	Some water
Vaqueros Formation	Light gray to light brown, massive fossiliferous coarse-grained sandstone	Very steep and rugged; prominent ledges; ridge caps	Landslides where fractured or fine-grained beds dip out of slope	Silty sand; clayey soils may be expansive	Rippable with heavy equipment; blasting may be required	Rockfalls; minor landsliding	Minor petroleum	Non-water bearing

[1] Hanson, 1983. [2] CDMG, 1973, Report 14.

Table 1. (Continued)

Stratigraphic Unit	Lithology[1]	Topographic Expression[2]	Slope Stability[2]	Soil Development and Problems[2]	Excavation Characteristics[2]	Seismic Response[2]	Mineral Deposits[2]	Hydrology[2]
Conejo Volcanics	Alternating andesitic and basaltic breccias and flows interbedded with fossiliferous, epiclastic sandstone and siltstone	Steep, rugged terrain; subdued topography where deeply weathered	Stable; rockfalls, rockslides; mudflows where soil and debris accumulated	Sparse soil on resistant units; substantial soil on less resistant units is moderately to highly expansive; expansive slope wash	Rippable with heavy equipment where weathered; extensive blasting	Rockfalls; rockslides	Crushed/broken stone; petroleum trap; nickel-copper	Water in fractures and vugs
Topanga Formation (Calabasas Formation)	Yellow to gray basal, interbedded sandstone and conglomerates overlain by a fine to medium-grained, micaceous sandstone; weathers to red brown	Varies from valleys and rounded hills to very steep, rugged slopes	Bedding-plane failures; rockslides and slumping	Silty, sandy soil, silty and clayey soil may be expansive	Rippable with heavy equipment; local blasting may be required	Landslides, surficial slumps, rockslides	Petroleum; sand and gravel	Locally water bearing
Modelo Formation	Gray to brown, fine-grained silty basal sandstone with overlying gray to brown, diatomaceous claystone and siltstone (weathers white)	Ridges and peaks in sandstone and dense siliceous shales; moderate to gentle slopes in shale and siltstone	Small and large scale slope failures; bedding plane and rotational slides, mudflows	Silty sand; extensive expansive to very expansive clayey soils; expansive slope wash	Rippable with little to moderate difficulty	Landslides; surficial slumps	Petroleum; gypsum; decorative stone	Locally water bearing
Saugus Formation	Coarse-grained arkosic sandstone and conglomerate; lower member of white, fairly well-sorted sandstone, coquina, conglomerate	Subdued, rounded topography	Small slumps	Deep sandy to silty soils; expansive locally	Rippable with heavy equipment	Slumping; moderate amplification of seismic waves	Sand and gravel	Water-bearing
Older Alluvium	Gravels, sands, and silts of stream terraces and older alluvial fan deposits	Flat to gently sloping, dissected elevated to cone-shaped surfaces	Slumping; raveling; rilling	Gravelly, silty sand; fine-grained may be expansive	Easily moved by heavy equipment; occasional boulders	Moderate to intense amplification of waves; slumping; liquefaction	Possible sand and gravel source	Water-bearing
Younger Alluvium	Silts, sands, gravels representing colluvium, slope wash, floodplain, stream channel deposits	Flat to gently sloping	Slump, mudflow, sheet wash, bank failure; cut slopes may slump, ravel, rill		Easily moved by heavy equipment; occasional boulders	Moderate to intense amplification or seismic waves; liquefaction, slumping	Sand and gravel	Water-bearing; major water source

[1] Hanson, 1983. [2] CDMG, 1973, Report 14.

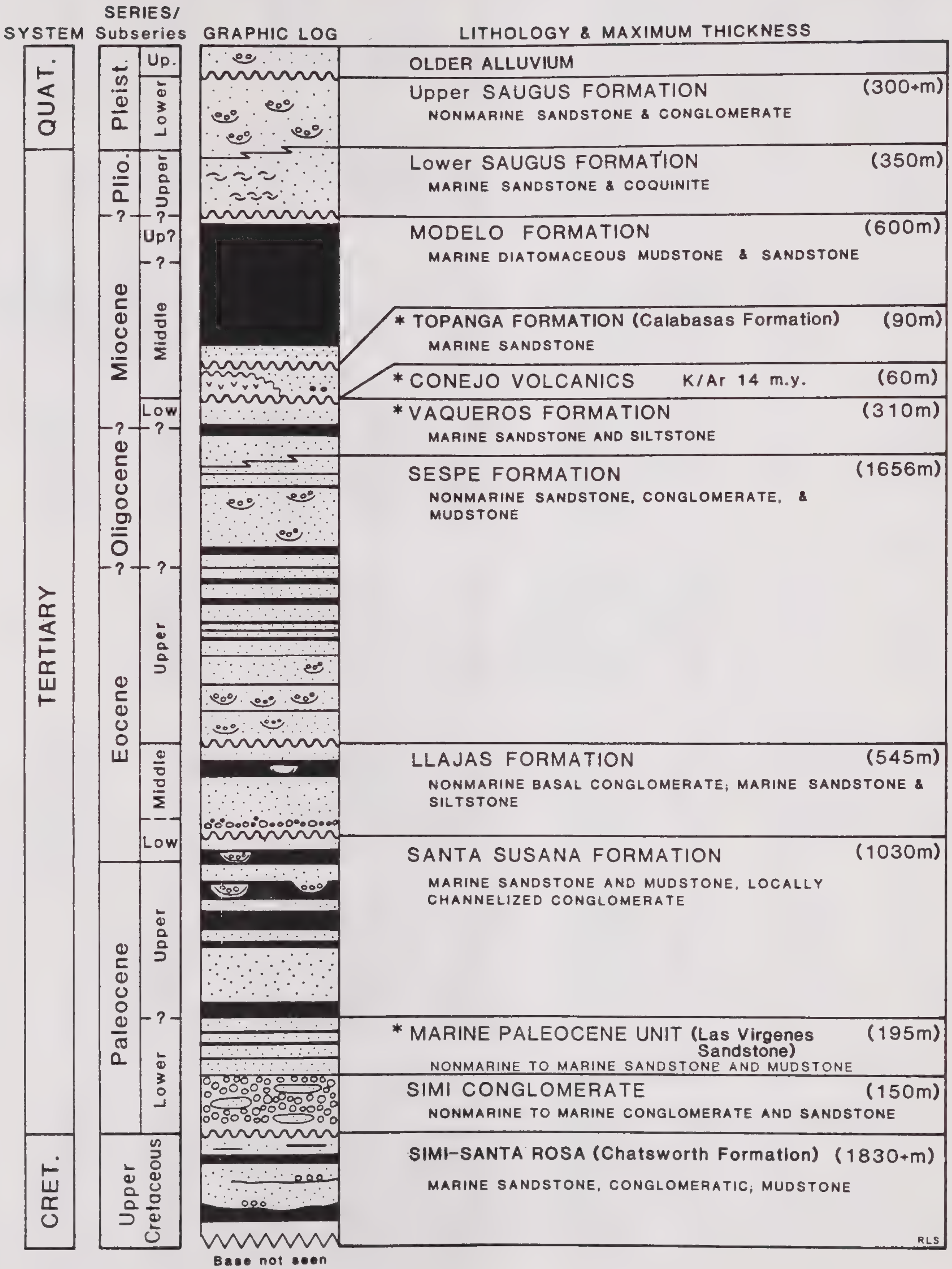


Figure 4

STRATIGRAPHIC COLUMN
SIMI VALLEY AREA

II. HAZARD EVALUATION

The purpose of this section is to identify and evaluate the potential public safety risks within Simi Valley. This section is the basis of the goals and policies of the Safety Element.

In the following paragraphs, six categories of hazards are discussed: geologic-seismic hazards, slope and ground stability hazards, water hazards, fire hazards, hazardous materials, and structural hazards. Several of the hazards evaluated in this Element may apply to more than one category but are only described in one section. For example, landslides are described as a ground stability hazard; however, landslides can be triggered by earthquakes and could be considered to be a seismic hazard.

A. GEOLOGIC-SEISMIC HAZARDS

Simi Valley is located in a geologically complex and seismically active region. In addition to local faults, the City is in proximity to several major regional fault systems, including the San Andreas Fault. Earthquakes from movement on local or regional faults have the potential to cause a variety of geologic and seismic hazards that can expose the public to a significant safety risk. The potential for geologic-seismic hazards within Simi Valley is discussed below:

1. Surface Rupture

a. General Description. The earth is laced with faults -- planes or surfaces in earth materials along which failure has occurred. Materials on opposite sides of the fault move relative to one another in response to the release of accumulated stress. Most of these faults have not moved for hundreds of thousands to millions of years and thus can be considered inactive. Others, however, show evidence of recent activity and can be considered active. A classification system devised by the California Division of Mines and Geology to describe recent fault activity and the potential for future fault movement is described as follows:

- Historically Active. Faults on which earthquakes have occurred during historic time (within the last 200 years) are classified as historically active. It is often difficult to pinpoint the exact fault responsible for an earthquake, because many small and moderate-size earthquakes do not cause groundsurface fault rupture, epicenters are not always well located, and fault patterns are often complex.

- Active. Faults that show evidence of displacement during the most recent epoch of geologic time, the Holocene, are classified as active. The Holocene epoch is usually considered to have begun 11,000 years ago. (See: Geologic Time Scale, Appendix B.)

- Potentially Active. Faults which displace deposits of Pleistocene age but show no evidence of movement in the Holocene period can be considered to be potentially active. Pleistocene time is the period between about 2 million years ago and 11,000 years ago.

- Inactive. Faults which show no evidence of movement in the Quaternary Period and show no potential for movement in the future are classified as inactive.

Faults that have moved in recent history or that exhibit signs of activity during the last 11,000 years represent the greatest risk for future movement, because the dynamic forces that caused the fault to move are potentially still exerting stress on that fault. Faults that do not exhibit signs of movement in the last 11,000 years may move in the future, but stress-creating factors have probably subsided. Therefore, historically active and active faults are generally believed to present the greatest risk to life and property.

Ground surface displacement along a fault, although more limited in area than the ground shaking associated with it, can severely damage structures built on top of the fault or fault zone. Fault displacement involves forces so great that it is generally not practically feasible (structurally or economically) to design and build structures to accommodate rapid displacement. Movement along a fault during a single earthquake can range from a few inches to tens of feet.

Fault displacement can also be in the form of barely perceptible movement called "fault creep." Damage by fault creep is usually expressed by the rupture or bending of buildings, fences, railroads, streets, pipelines, curbs, and other linear features.

b. Effects of Surface Rupture. Permanent effects of ground displacement may include abrupt changes in the ground surface elevation, alteration of surface drainage patterns, changes in groundwater levels, misalignment of streets and property lines, and a permanent change in the gradient of sewer and water utilities.

Secondary effects of ground displacement could include the disruption of traffic and emergency services due to road and bridge destruction, damage to drainage facilities resulting in flooding, and the disruption of vital utilities and community services.

c. Inventory of Local Faults. Figures 5a and b depict the location of important, known local faults within Simi Valley. This map is meant to be used for general planning purposes only and not as a substitute for detailed geologic evaluation necessary to precisely define a fault on a project-by-project basis. No faults within the Simi Valley area of interest are within a Alquist-Priolo Special Studies Zone (see definition under "Programs").

- Simi-Santa Rosa Fault. The Simi-Santa Rosa fault is an east-west trending fault that crosses the northern margin of the city at the base of the foothills of the Santa Susana Mountains (Figure 5). The fault is north-dipping with reverse movement (north side is upthrown). In the Simi Valley area, much of the Simi-Santa Rosa fault is concealed within or under alluvium. The location of the fault is based on oil well data, topography, and limited trenching. The Simi-Santa Rosa fault may not be a single fault strand but a complex zone of faulting. A system of minor northeast striking, north and south dipping subsidiary faults cut the Sespe Formation north of the main fault trace (Hanson, 1981).

Estimates of the most recent movement of the Simi fault range from late Pleistocene to Holocene. Oil well data, geomorphic features, and a road cut exposure in Simi Valley indicate late Pleistocene movement (Hanson, 1981). Recent trenching in the Camarillo area on the Springville fault, a possible western extension of the Simi-Santa Rosa fault, indicates possible Holocene movement.

Evidence of Pleistocene movement includes displacement of the Plio-Pleistocene Saugus formation; the presence of a late-Quaternary, eroded fault scarp along the northern border of Simi Valley; and the tectonic expression of the Camarillo and Las Posas Hills as pressure ridges due to post-Saugus movement on the fault (Yeates, 1983). Also, according to Yeates, late Quaternary movement on the fault possibly caused temporary ponding of the Arroyo Simi, accounting for the thick accumulation of alluvial sediments in Simi Valley. A road cut along Tapo Canyon Road at the north edge of Simi Valley shows a splay of the Simi-Santa Rosa fault cutting older alluvium and/or the Saugus formation (CDMG, 1975). Fine sandstone and siltstone of the Eocene age Llajas formation are thrust up over the uppermost Saugus formation and/or older alluvium of middle to upper Quaternary age.

Recent trenching by Petra Geotechnical (1990) along the Springville fault in Camarillo uncovered evidence of Holocene movement. Deep trenches (25 foot) revealed a north-dipping low angle reverse fault which thrust bedrock of the Pleistocene Saugus (San Pedro) formation over colluvium of possible Holocene age. Trenching by Moore and Taber in April 1990 along the Springville fault in Camarillo also exposed bedrock of the Pleistocene Saugus Formation thrust over colluvium of possible Holocene age. The evidence from recent trenching indicates that there is evidence for geologically-recent movement on the Springville fault and that it should be considered active. If the Springville fault is an extension of the Simi-Santa Rosa Fault, then the Simi-Santa Rosa Fault may also be active.

Similar evidence of recent movement on the Simi fault has not been conclusively demonstrated in Simi Valley; however, recent trenches have

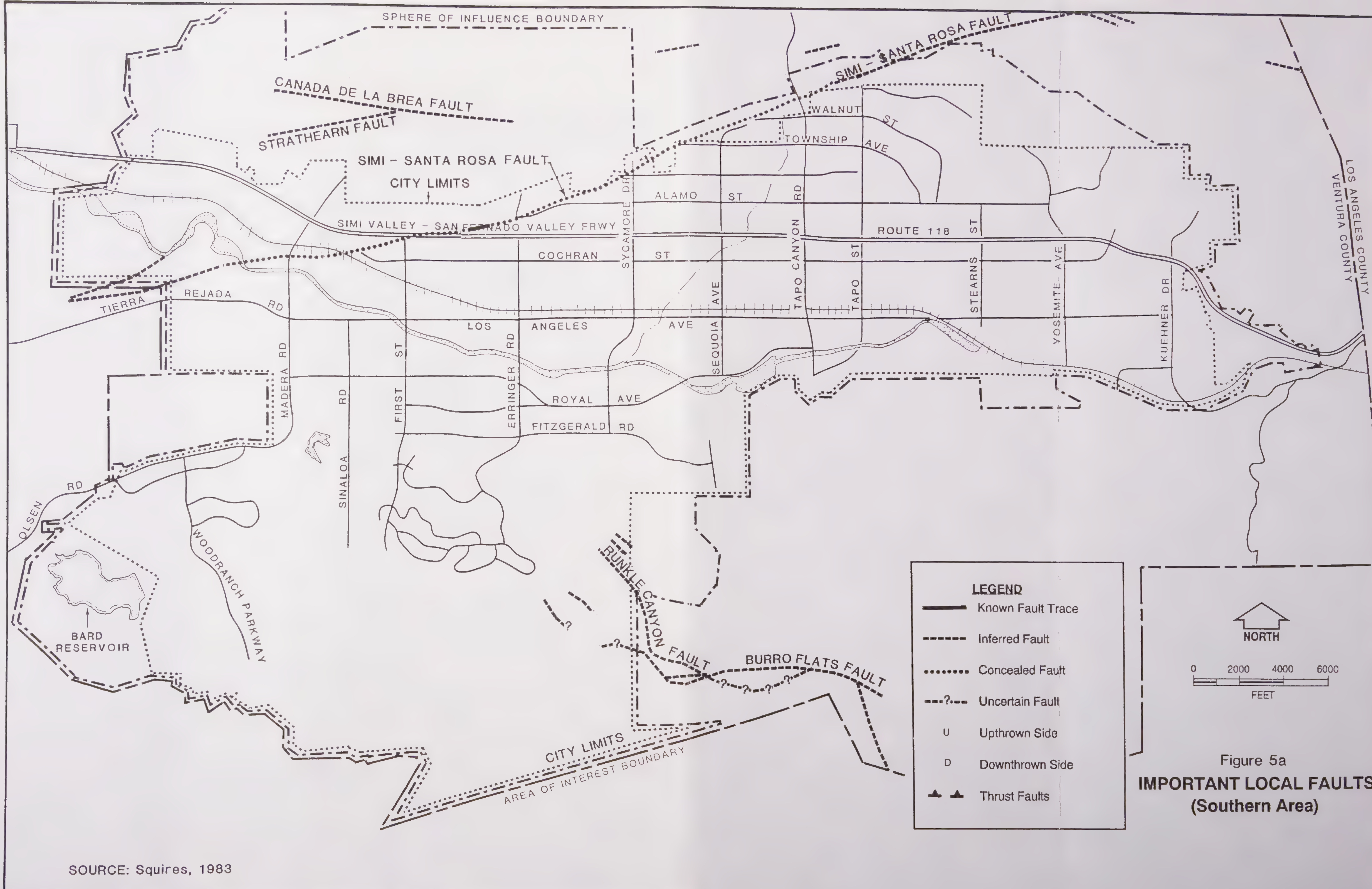
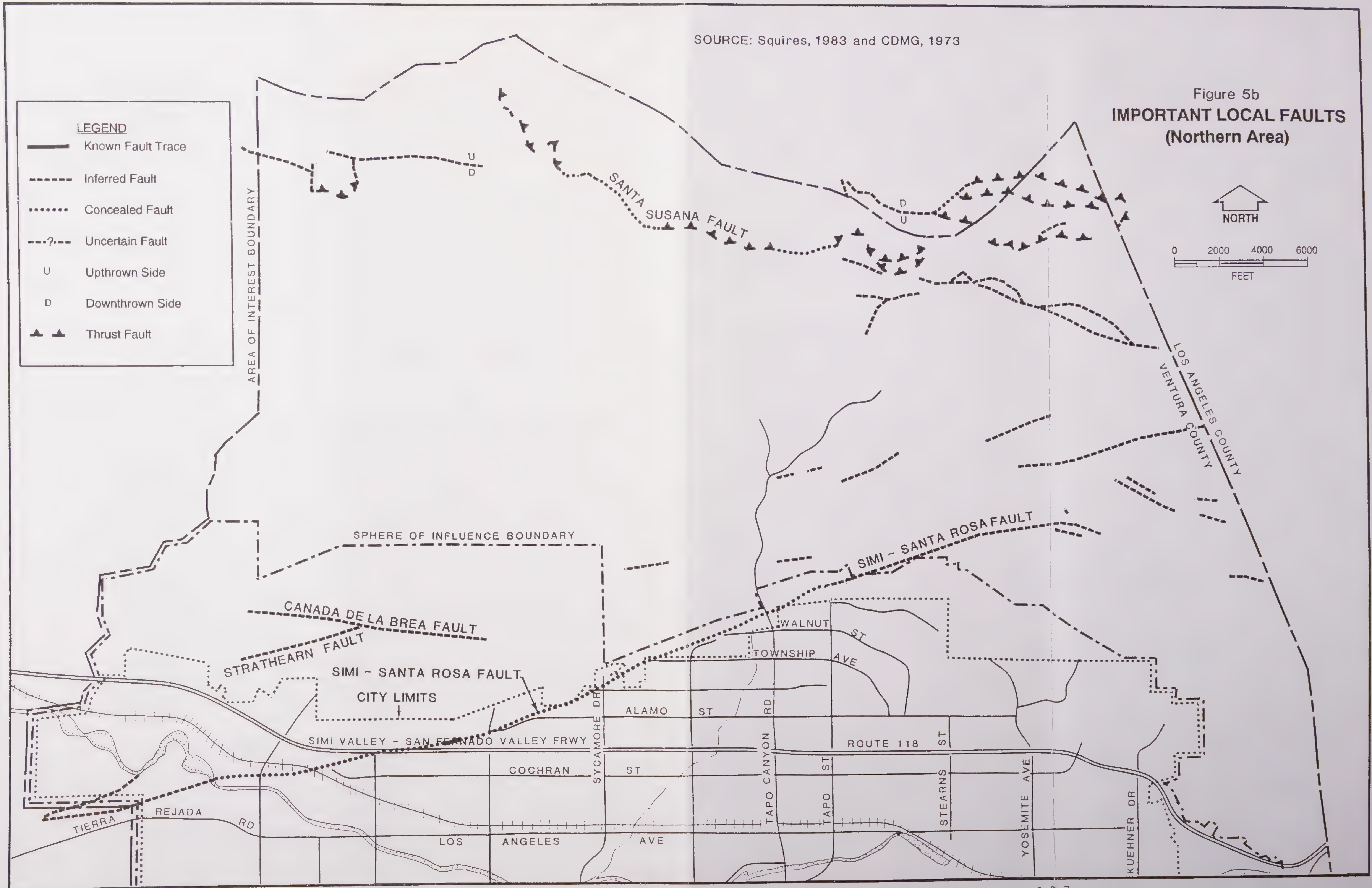


Figure 5a
IMPORTANT LOCAL FAULTS
(Southern Area)


SOURCE: Squires, 1983 and CDMG, 1973
Figure 5b
IMPORTANT LOCAL FAULTS
(Northern Area)
LEGEND
Known Fault Trace
Inferred Fault
Concealed Fault
Uncertain Fault
Upthrown Side
Downthrown Side
Thrust Fault
NORTH
0 2000 4000 6000
FEET
AREA OF INTEREST BOUNDARY
SANTA SUSANA FAULT
SPHERE OF INFLUENCE BOUNDARY
CANADA DE LA BREA FAULT
STRATHEARN FAULT
SIMI - SANTA ROSA FAULT
CITY LIMITS
SIMI - SANTA ROSA FAULT
LOS ANGELES COUNTY
VENTURA COUNTY
WALNUT ST
TOWNSHIP AVE
ALAMO ST
SIMI VALLEY - SAN FERNADO VALLEY FRWY
ROUTE 118
COCHRAN ST
SYCAMORE DR
TAPO CANYON RD
TAPO ST
STEARNS ST
YOSEMITE AVE
KUEHNER DR
TIERRA REJADA RD
LOS ANGELES AVE

been excavated to sufficient depths (35 feet or deeper) to uncover signs of movement (Geolabs - Westlake Village, February 1991). The trenching done by Geolabs did identify traces of the Simi-Santa Rosa fault in Simi Valley. The age was estimated to be 8,000 - 15,000 years old. Therefore, the fault appears to be a potentially active fault in this area.

- Santa Susana Fault. The Santa Susana fault is a north-dipping reverse fault which displaces Miocene Modelo formation over the Plio-Pleistocene Saugus formation and Quaternary terrace deposits. Trenching by Lung and Weick, 1983, in the tributary canyons northwest of Tapo Canyon exposed the Modelo formation juxtaposed over terrace deposits both of which are overlain by undisturbed Pleistocene-age fan deposits. Since the fan deposits are not cut by the Santa Susana fault, Lung and Weick (1983) believe that the most recent movement on the fault was greater than 10,000 years ago.

  The Santa Susana fault has had very low seismicity, although the 1893, Newhall area earthquake of maximum Modified Mercalli Intensity IX (see Appendix C) may have been caused by the Santa Susana fault (CDMG, 1975). A magnitude 4.6 earthquake in 1976 also was centered near the Santa Susana fault. Surface rupture was attributed to the Santa Susana fault near the Aliso Canyon Oil field in response to the 1971 San Fernando earthquake. Subsequent trenching studies conducted across this fault to the east and north of the City of Simi Valley, however, have indicated that the Santa Susana fault has not experienced surface rupture in the last 100,000 years. Since sympathetic movement may have occurred on the Santa Susana fault due to nearby earthquakes and because this fault may be associated with historical earthquakes, a potential for future displacement along the fault should be considered when siting structures near this fault.

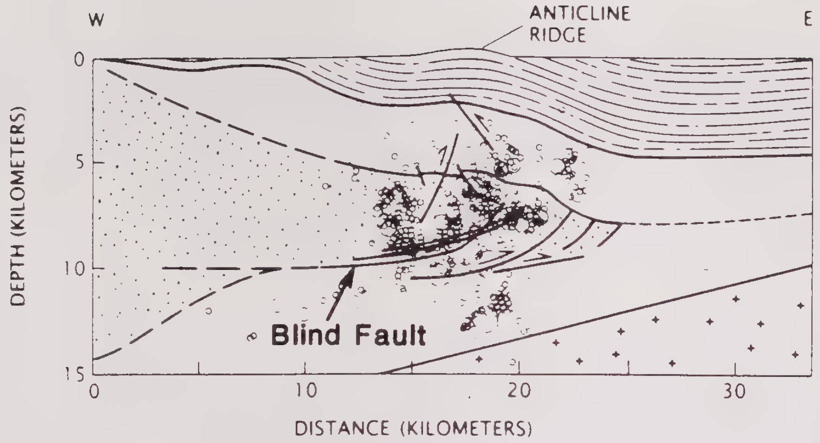
- Canada de la Brea/Strathearn. The Canada de la Brea fault is an east-west trending, north-dipping fault just north of Simi Valley. It forms the upstructure trap of the Oak Park and Canada de la Brea oil fields. The Strathearn fault splays from the Canada de la Brea fault near the head of Brea Canyon (Figure 5). Last movements on both faults

are thought to be pre-Saugus, since the base of the Saugus formation is not offset by the faults (Hanson, 1983). Little or no potential for movement exists on the two faults. for planning purposes the Canada de la Brea and Strathearn faults are considered to be inactive.

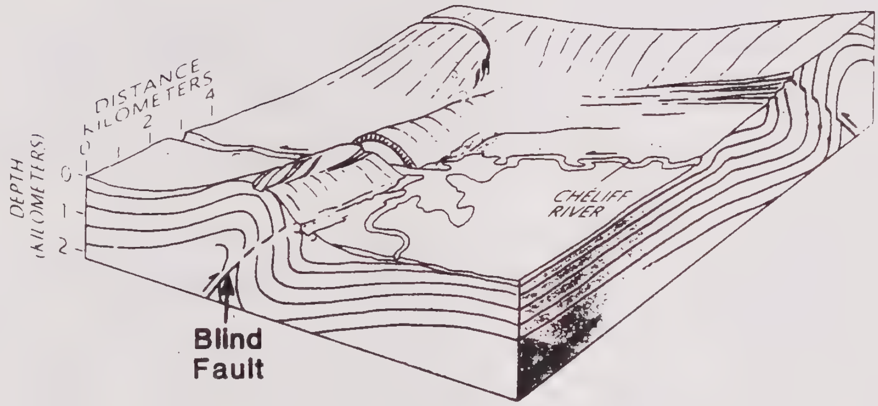
- Burro Flats/Runkle Canyon. The Burro Flats and associated offshoot Runkle Canyon fault cut the Simi Hills south of Simi Valley. The Burro Flats fault trends roughly east-west and has a nearly vertical dip. According to Yeates, 1983, the Burro Flats fault was active in the Paleocene and early Eocene. The Eocene Llajas formation is offset about 80 meters and the Oligocene Sespe formation shows no offset along the fault. The potential for displacement along the Burro Flats and Runkle Canyon faults is very low, therefore, these faults are considered to be inactive.

- Blind Faults. In a recent Scientific American article (1989), Stein and Yeates present evidence that large folds or anticlines such as the Ventura Anticline (and possibly the Simi anticline) are associated with blind faults (low angle thrust faults which do not reach the surface). Displacement along the blind faults is greatest at depth and decreases to zero at some point below the surface, thus the faults are not visible at the surface. Owing to offset of the fault at depth, geologic layers near the surface which are not cut by the fault are warped upward into a fold. The fault propagates towards the surface with time, and may eventually reach the surface. Figure 6 shows examples of anticlines associated with blind faults.

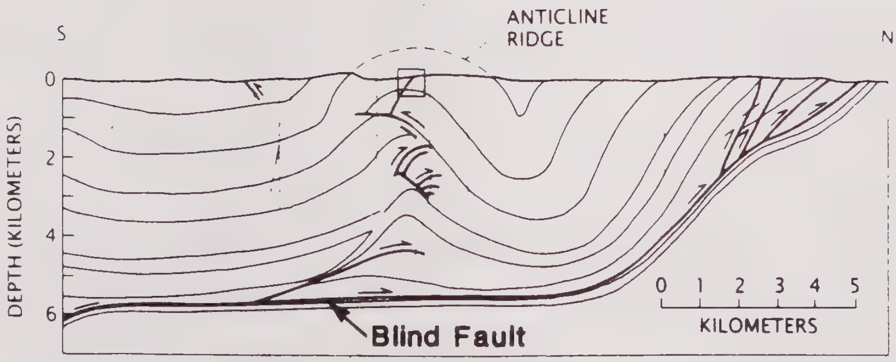
  The blind faults or subsurface, low-angle thrust faults are of interest because they may be the source of earthquakes where there are no known surface faults. This was the case with the 1987 magnitude 6 Whittier earthquake which occurred on the previously unknown, subsurface Whittier Narrows fault (Yeates and Stein, 1989). Other earthquakes associated with blind faults include the 1980 El Asnam, Algeria, earthquake (M=7.3), the 1983 Coalinga earthquake (M=6.5), the 1985 Kettleman Hills earthquake (M=6.1), and possibly the 1988 Armenian earthquake.



Coalinga, California



El Asnam, Algeria



Ventura, California

Source: Stein and Yeates, 1989

Figure 6
BLIND FAULT EXAMPLES

The Simi anticline may be similar to the El Asnam anticline depicted in Figure 6. At El Asnam the blind fault separates the anticline from an adjacent syncline. In Simi Valley, the Simi-Santa Rosa fault similarly separates the Simi anticline and Simi syncline. The Simi-Santa Rosa fault may actually be a blind fault that has reached the surface.

If a blind fault exists beneath the Simi anticline it would be very near the Simi-Santa Rosa fault and its movement would probably be related to movement on the Simi-Santa Rosa fault.

d. Local Risk of Surface Rupture. Areas within Simi Valley with the greatest potential to experience future ground displacement as a result of a fault rupture are those properties located along the trace of the Simi-Santa Rosa Fault. This area includes the areas along the edge of the foothills of the Santa Susana Mountains (see Figure 5). Several critical structures and facilities are located on or near this fault.

The term "critical facilities" refers to structures or services that are vital to the community's ability to respond to a major disaster and that are required to minimize loss of life and property. These types of facilities include police and fire stations, hospitals, and electrical, water (such as storage and pumping facilities), and communication facilities. Other types of critical structures include buildings that are used for public assembly such as schools, and transportation structures such as bridges and overpasses.

Because of the uncertainty in locating the Simi-Rosa Fault, critical facilities within about a one-half mile of the mapped trace of the Simi-Rosa Fault are identified below. These include, from west to east, the Simi Valley County Sanitation District Wastewater Treatment Plant, the City of Simi Valley's Public Services Center, Simi Valley Unified School District Educational Center, Atherwood Elementary School, Adventist Hospital, Township Elementary School, Valley View Junior High, Fire Station #46 (Tapo St.), and Big Spring Elementary School. Adventist Hospital is the nearest critical facility to the fault. The Simi-Santa Rosa Fault also crosses Route 118 near the First Street overcrossing bridge.

No major structures presently exist along the Santa Susana Fault in the Simi Valley planning area. Future development near the fault zone should consider the potential for ground displacement along the fault.

2. Ground Shaking

a. General Description. In California, the largest losses of life and property due to a geologic hazard will be caused by ground shaking from earthquakes. Ground shaking is one of the most difficult seismic hazards to predict and quantify. The extent and severity of ground shaking at a particular site is controlled by many factors including:

- Earthquake Magnitude. Earthquake magnitude is commonly measured on the Richter Scale. This is a logarithmic measurement of the total amount of energy released by an earthquake.

- Near Surface Amplification. The presence of unconsolidated soils above bedrock can have an amplifying effect on earthquake seismic waves. Ground shaking resulting from long period seismic waves is usually most severe in thick, unconsolidated sediments and less severe in solid bedrock. Short period seismic waves can have a more damaging effect in well compacted soil or bedrock.

- Distance From Epicenter. As earthquake seismic waves move through the ground, they attenuate or lose energy. Over long distances this loss of energy is significant.

- Duration of Strong Shaking. How long ground shaking continues plays a major role in determining the amount and extent of structural damages and ground failure from an earthquake.

- Fundamental Periods. Every structure has its own fundamental period or natural vibration period. If the natural vibrations of ground shaking coincide with the natural vibration period of a structure, structural damage can be greatly increased.

A measure of the ground shaking severity is maximum ground acceleration, the speed the ground moves measured in "g's" (acceleration of gravity). A vertical ground acceleration of 1.0 g will throw loose objects into the air.

Intense ground shaking in areas of unconsolidated, water-saturated, alluvial sediments can result in soil liquefaction and lateral movement of nearly level areas. Seismic shaking can renew movement of old landslides as well as result in formation of new slides. The combination of relatively weak bedrock, deep weathering, steep slopes, and inclined bedding can combine to make hillside areas highly susceptible to landslide failure during seismic shaking.

The extent of damage suffered during an earthquake can also depend on non-geologic factors. The type of building and its structural integrity can dictate the severity and extent of the damage suffered. Generally, small one-, two-, and three-story wood and steel frame buildings have performed well in earthquakes because of their light weight and flexibility. Reinforced concrete structures will also usually perform well. Buildings constructed from non-flexible materials, such as unreinforced brick and concrete, hollow concrete block, clay tile, or adobe are more vulnerable to earthquake damage.

It is generally economically infeasible, using the present construction techniques, to build a totally earthquake-proof structure; therefore, a certain amount of risk must be accepted. It is possible, however, to build earthquake-resistant structures that will not pose a collapse or loss of function hazard in strong earthquakes.

b. Effects of Ground Shaking: The primary effect of ground shaking is the damage or destruction of buildings, infrastructure, and possible injury or loss of life. Building damage can range from minor cracking of plaster to total collapse. Disruption of infrastructure facilities can include damage to utilities, pipelines, roads, bridges, etc. Secondary effects can include ground and slope failure and possible sympathetic movement along other faults.

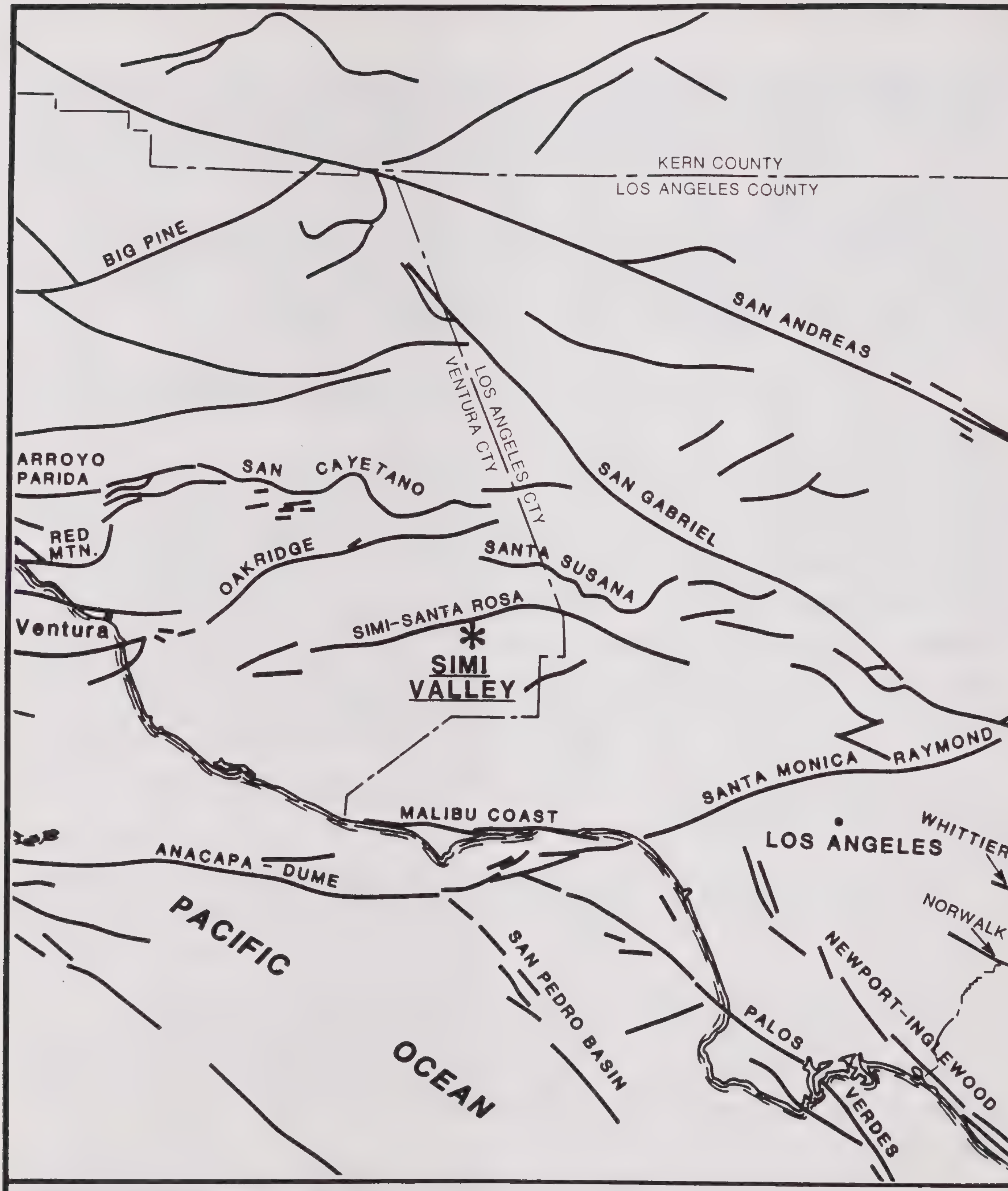
c. Historical Ground Shaking. Historically, several earthquakes on major active faults in Southern California have caused significant ground shaking in Simi Valley. Figure 7 depicts known major faults in Simi Valley and the

surrounding region. Epicenters of historical earthquakes within 62 miles (100 km) of the city are shown on Figure 8. Of the 1,132 epicenters depicted on Figure 8, 368 are duplicates. Also, clusters of epicenters usually indicate aftershocks of major events. Table 2 lists the major historical earthquakes and their effects in the Simi Valley area. Only those earthquakes which were felt as a Modified Mercalli Intensity (MMI) V or greater are listed. A description of the Modified Mercalli Intensity Scale is included in Appendix C.

The Simi Valley area has not directly experienced a devastating earthquake in historical time. Table 2 shows that the maximum intensity in Simi Valley was MMI-VI from several major earthquakes in Southern California. The great earthquakes of 1812 and 1857 caused no known damage in Simi Valley because the area was very sparsely populated at the time. However, missions from La Purisma to San Fernando were extensively damaged in 1812. In 1857, damage again was reported in San Buenaventura and San Fernando. Extensive damage could occur if earthquakes of those magnitudes were to shake Simi Valley today or in the future. A 1988 study by the US Geological Survey suggests that there is a 60 percent chance of a magnitude 8 earthquake on the south central segment of the San Andreas fault in the next 30 years. The portion of the south central segment of the San Andreas fault nearest to Simi Valley, about 31 miles to the north, ruptured during the 1857 earthquake.

The only significant known damage from ground shaking in Simi Valley resulted from the 1971 San Fernando earthquake. The east wall of the 1912 Santa Susana Hotel at Tapo Street and Los Angeles Avenue collapsed during the earthquake. At Tierra Rejada Road and Los Angeles Avenues, the foundation of the relatively new K-Mart Store apparently shifted breaking a gas line. Also, rockfalls were reported in Santa Susana Pass and Tapo Canyon. A bedrock landslide also occurred in Tapo Canyon (CDMG, 1975).

d. Inventory of Local Ground Shaking Potential. Available geologic information indicates that the potential for strong ground shaking in Simi Valley is high. The highest intensity of ground shaking documented in Simi Valley was only a Modified Mercalli Intensity VI. However, severe ground shaking due to movement along a local or regional fault (e.g., the San Andreas) could cause significant damage throughout Simi Valley.



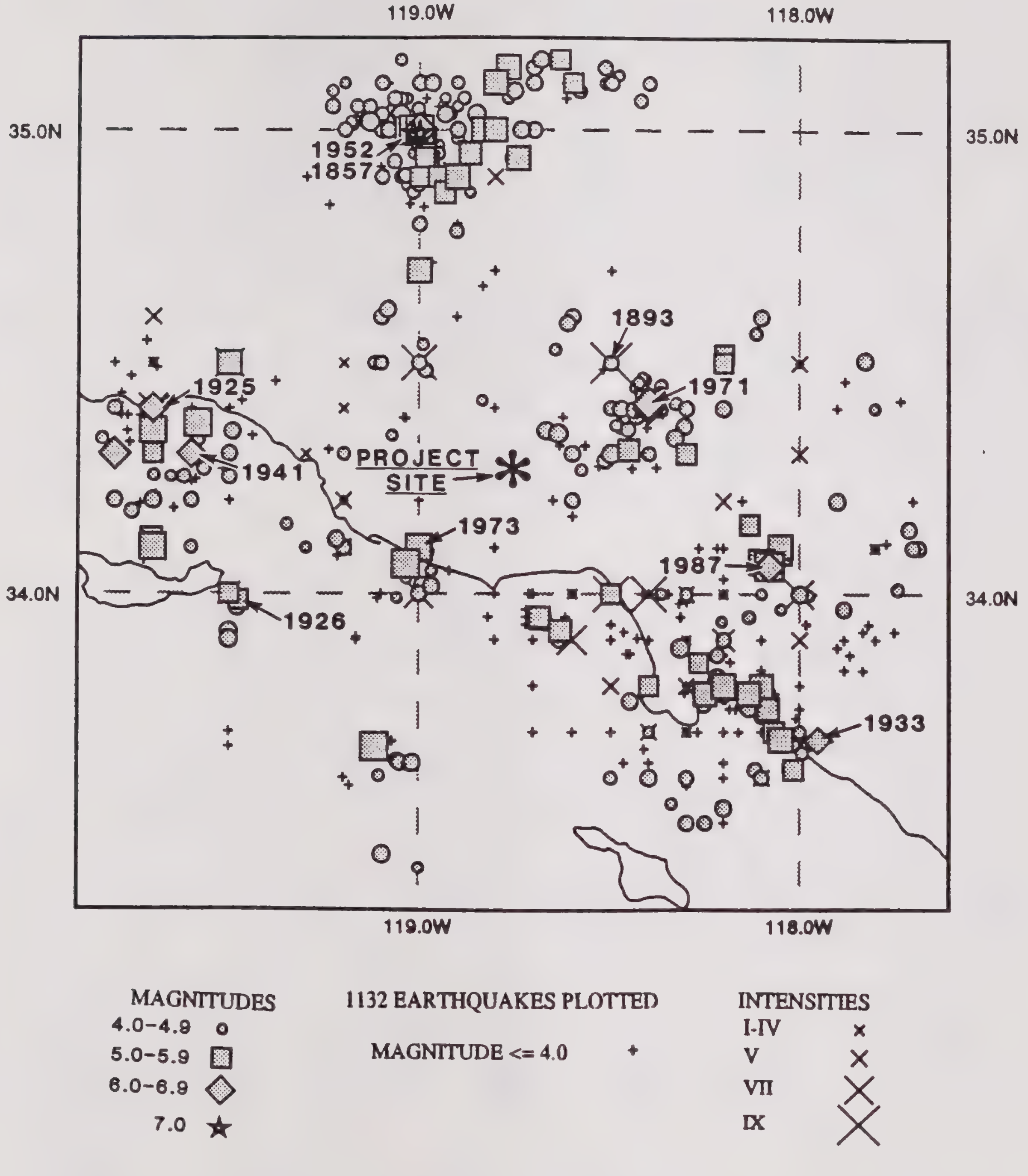
SOURCES: Modified from Jennings, 1975
and Ziony and Yerkes, 1985

NORTH

0 10
MILES

Figure 7

GENERALIZED MAP OF ACTIVE AND POTENTIALLY ACTIVE FAULTS IN SOUTHERN CALIFORNIA



Source: National Geophysical Data Center/
NOAA Boulder, CO 80303

NORTH

0 25 MILES

Figure 8

EPICENTERS OF HISTORICAL EARTHQUAKES WITHIN 100KM OF SIMI VALLEY

Table 2. Effects of Historical Earthquakes in Simi Valley

Year	Earthquake	Fault	Epicenter Location[2] Latitude	Longitude	Magnitude[1]	Distance of Epicenter from Simi Valley[2] (miles)	Modified Mercalli Intensity in Simi Valley[1,3,4,5]	Reported Significant Damage in Simi Valley[1]
1812	Santa Barbara Region	?	?	?	7 (estimated)	?	?	Extensive damage to missions from La Purisma to 116 miles south at San Fernando
1857	Fort Tejon	San Andreas	35°00' (to the nearest degree)	119°00'	8 (estimated)	38?	?	Damage in Buenaventura and San Fernando
1893	Newhall Area	Santa Susana ?	34°30' (to the nearest 30 minutes)	118°30'	(IX)[5]	15?	?	
1925	Santa Barbara	Mesa?	34°18'	119°48'	6.3	59	?	
1926	Southwest of Ventura Offshore	?	34°00'	119°30'	5.0	46	?	Damage to telephone equipment in Simi Valley
1933	Long Beach	Newport-Inglewood	33°35'	117°59'	6.3	53	VI	
1941	Santa Barbara Offshore	?	34°22'	119°35'	5.9	48	V	
1952	Arvin-Tehachapi	White Wolf	35°00'	119°00'	7.7	52	VI	
1971	San Fernando	San Fernando	34°25'	118°24'	6.4	22	VI	Rockfalls in Santa Susana Pass and Tapo Canyon; bedrock slide in Tapo Canyon; collapse of east wall of 1912 Santa Susana Hotel; damage to older structures
1973	Point Mugu Offshore	Malibu Coast	34°04'	119°02'	5.9	21	?	
1987	Whittier Narrows	Whittier	34°04'	118°05'	6.1	41	V	

[1] CDMG, 1975, OFR 76-5, NOAA, 1990

[2] NOAA, 1990, measured from the intersection and Sycamore Avenue and Route 118

[3] CDMG, 1975, Bulletin 196

[4] EERI, 1988

[5] Maximum Modified Mercalli Intensity

Known major faults in Simi Valley and throughout southern California that are considered to have the potential to result in damaging ground shaking in the City are depicted in Figure 7. The ground accelerations expected in Simi Valley on regional and local active and potentially active faults, within about 30 miles of Simi Valley are shown in Table 3. The acceleration values are estimated using Campbell's (1981) relationships based on distance from the fault and estimated maximum probable and maximum credible earthquake magnitudes. A maximum probable earthquake is the maximum earthquake that is likely to occur during a 100-year interval (CDMG, 1975). A maximum credible earthquake event is the largest earthquake that a fault is believed to be capable of generating, without regard to the recurrence interval (CDMG, 1975). The maximum probable earthquake is normally analogous to a design level event and the maximum credible earthquake to an extreme event.

Potential amplification of ground shaking throughout the city is shown on Figure 9. The amplification of ground shaking areas are based on the concept that ground shaking is partly determined by the period of seismic waves and the thickness of the alluvium or unconsolidated material overlying bedrock or consolidated earth material (Rogers et al., 1985). The boundaries of the potential ground shaking amplification areas are very approximate. The response of structures and amplification of certain ranges of ground vibration may vary greatly within an area during an earthquake depending upon the earthquake magnitude, location, depth of focus, and distance as well as depth of unconsolidated material at a site. Present technology will, however, allow determination of the likely ground response at an individual site, but only after detailed geologic, seismologic, and soils engineering investigations of the site have been conducted. Generalized potential amplification of ground shaking hazard areas are identified below.

- <u>Moderate to Strong Amplification of Long Period Ground Shaking</u>. Areas located in the central part of the valley where unconsolidated alluvium is greater than 50 to 100 feet in depth could experience moderate to strong amplification of long period ground shaking. Such amplification could cause significant damage to poorly-designed, multi-story structures.

Table 3. Estimated Maximum Probable and Maximum Credible Ground Accelerations

Fault Name	Distance[1] (miles)	Estimated Richter Magnitude		Estimated Mean Peak Ground Acceleration[2]	
		Maximum Probable	Maximum Credible	Maximum Probable	Maximum Credible
Simi - Santa Rosa	1	5.5	7.0	0.43	0.68
Santa Susana	4	6.0	7.5	0.26	0.54
Oakridge	8	5.75	7.5	0.13	0.38
San Cayetano	10	6.25	7.5	0.15	0.34
San Fernando	15	6.5	7.25	0.11	0.19
San Gabriel	15	6.0	7.5	0.08	0.22
Malibu Coast	16	5.75	7.5	0.07	0.24
Santa Ynez	23	6.0	7.5	0.05	0.16
San Andreas	31	8.25	8.5	0.20	0.28

[1]Jennings, 1975, measured from the intersection of Tapo Canyon Road and Route 118.

[2]Campbell, 1981.

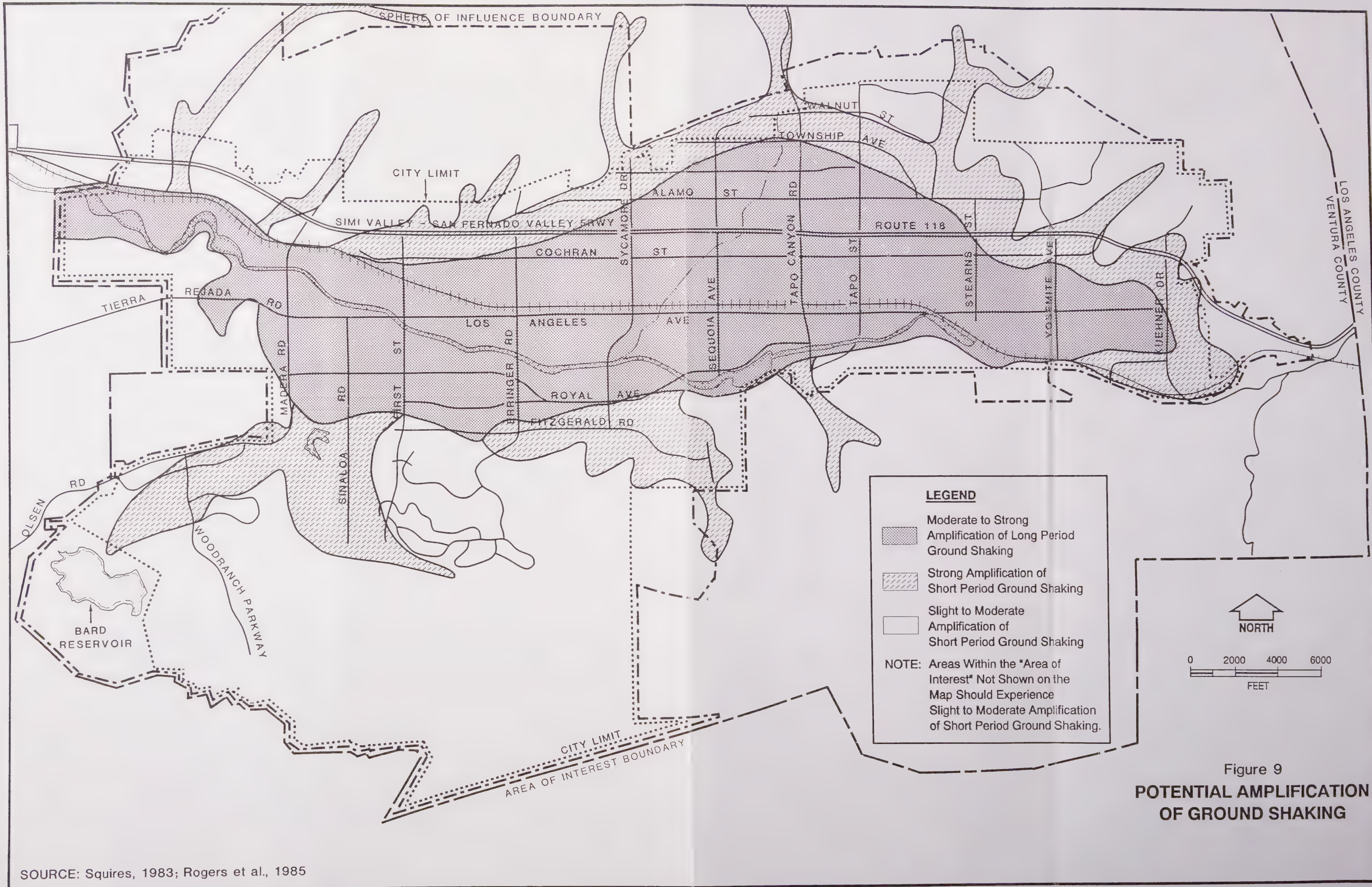


Figure 9

POTENTIAL AMPLIFICATION OF GROUND SHAKING

McClelland consultants

- o Strong Amplification of Short Period Ground Shaking. Areas at the edges of the valley underlain by alluvium less than 50 feet in depth could experience strong amplification of short period ground shaking that are particularly damaging to poorly designed and/or constructed smaller buildings.

- o Slight to Moderate Amplification of Short Period Ground Shaking. The hillside areas are generally underlain by sedimentary bedrock. These areas could experience slight to moderate amplification of short period ground shaking. Other hazards, such as landslides, may significantly increase the hazard potential in the area.

d. Local Resources Potentially Affected by Ground Shaking. Amplification of ground shaking is a poorly understood phenomenon. The hazard areas identified on Figure 9 are generalized and are not a substitute for site-specific analyses which may be required to determine the seismic response of a site and corresponding foundation and structural design parameters for a particular structure. In the event of a moderate to strong earthquake (6.0 or greater magnitude) originating in southern Ventura County or western Los Angeles County or a major earthquake (8.0 to 8.5 magnitude) along the San Andreas fault, damage to many existing structures could be severe and some loss of life could occur. The entire city could experience potentially damaging ground shaking.

3. Liquefaction

a. General Description. Liquefaction is a temporary, but substantial, loss of strength of saturated, granular soils, such as sand, that may occur during a major earthquake. Earthquake-induced ground shaking tends to compact and decrease the volume of the soil; if rapid drainage cannot occur, the tendency to reduce the volume of the soil will cause an increase in the pressure of the water within the soil pore spaces. If the water pressure is great enough, soil grains will actually be pushed apart by the water. This process can transform stable granular material into a fluid-like state similar to quicksand. The potential for liquefaction is greatest in areas with loose, granular, low-density soils, where the water table is within about 15 to 40 feet of the ground surface.

b. Effects of Liquefaction. When quicksand-like conditions develop due to liquefaction, buildings and other objects on the ground surface may tilt or sink, and lightweight buried structures (such as pipelines) may float toward the surface. Liquefaction may also manifest itself by the development of cracks in the ground surface, followed by the emergence of a sand/water mixture from the crack. Considerable depths of water may accumulate on the ground surface, and characteristic sand boils, sand volcanoes, and sand ridges may form.

Extreme settling of the ground may result from liquefaction. In areas underlain by thick deposits of sediment, subsidence as much as several feet may result, creating new shorelines in areas near bodies of water. Ground settlement is often differential because the sand and water are seldom removed evenly over broad areas. Liquefaction may also lead to the lateral spreading of soft saturated soils. This can result in the rapid or gradual loss of strength in the foundation materials such that structures settle or break up as the foundation soils flow out from beneath them. If a layer of soil below the ground surface liquefies, the liquefied layer can act as a slip-plane for large, destructive landslides. This can occur on slopes as gentle as 2.5 percent (United States Geological Survey, 1974).

Proper preparation of the soil foundation beneath a structure can reduce the potential for liquefaction. Soil foundation preparation typically requires densification or recompaction of loose, unconsolidated soils and/or lowering of the water table.

c. Inventory of the Local Liquefaction Hazard. No incidences of liquefaction have been reported in Simi Valley. Eyewitness reports of the effects of the 1857 Fort Tejon Earthquake (magnitude 8.0) on the San Andreas Fault suggest that there was liquefaction along the Santa Clara River. Liquefaction occurred in the San Fernando Valley during the 1971 San Fernando earthquake and in the lower Santa Clara River during the 1973 Point Mugu earthquake. The magnitudes of the above two earthquakes were much less than the Fort Tejon Earthquake but they were centered closer to the Simi Valley. More earthquakes of this size are possible in the area and could result in liquefaction-related property damage.

The high liquefaction hazard zone, as shown on Figure 10, covers the western and eastern parts of the city and includes a zone along Arroyo Simi. Areas

depicted are underlain by Quaternary alluvial sediments with water levels within 15 feet of the surface. Present water levels are believed to represent the basin in its natural state (Leighton and Associates, 1985). The moderate hazard zone includes alluvial areas with water levels between 15 and 40 feet of the surface.

d. Local Resources Potentially Affected by the Liquefaction Hazard. Areas within the City that could experience liquefaction during a seismic event include residential areas, several schools, one fire station, the Simi Valley County Sanitation District Wastewater Treatment Plant, the City of Simi Valley's Public Services Center, the Calleguas Municipal Water District main pump station, and other facilities in western and eastern Simi Valley.

The structures and areas listed above are those that are located within the boundaries of the hazard zones on Figure 10. The information used to define the potential liquefaction hazard zones was the best available but does not allow precise delineation of the hazard areas. The hazard zone boundary lines fluctuate seasonally and with changes in the groundwater level. Site specific investigations must be conducted to accurately determine the potential for liquefaction at a project site.

4. Seiche

a. General Description. A seiche (pronounced sāsh) is a wave or series of waves or oscillations, set up in an enclosed or partially enclosed body of water by wind, an earthquake, or a landslide. The most common seiches are set up in lakes and bays, either directly or indirectly by earthquakes. The shaking of an earthquake can cause large destructive waves tens of feet above normal lake level. Large waves can be produced when fault displacement under a reservoir either displaces a quantity of water or tilts the lake bed suddenly. Earthquakes can also trigger landslides into an enclosed body of water producing massive waves. The waves cause damage on the shore opposite the slide or cause overtopping of the dam.

b. Effects of the Seiche. The primary threat from a seiche is to structures and facilities in or very near a lake, harbor, or bay. Boats and their wharfage can be heavily damaged by seiches, and buildings and campgrounds can be inundated. The extent of most seiches is usually limited to ten to twenty feet above water level, and the duration is usually limited to a few minutes.

Large seiches produced by landslides, however, can overtop the dams of man-made lakes and reservoirs, causing flooding and possible loss of life in the areas downstream. This overtopping can also wash out earth-fill dams, causing their complete collapse. Within Simi Valley the actual threat posed by seiches is small.

c. Local Inventory of the Seiche Hazard. A potential hazard from seiches exists from the Bard Reservoir (Wood Ranch dam and levees), but the threat is considered remote. Facilities in, or very near, the reservoir could be affected by seiche waves in the reservoir. The hazard zone surrounds Bard Reservoir up to an elevation of 10 feet above the water level as shown on Figure 11. The 10-foot figure is believed to be a conservative estimate of potential seiche run-up. If the seiche causes overtopping of the dam, facilities within the dam inundation area of the Bard Reservoir could be affected (see "Dam Inundation" section).

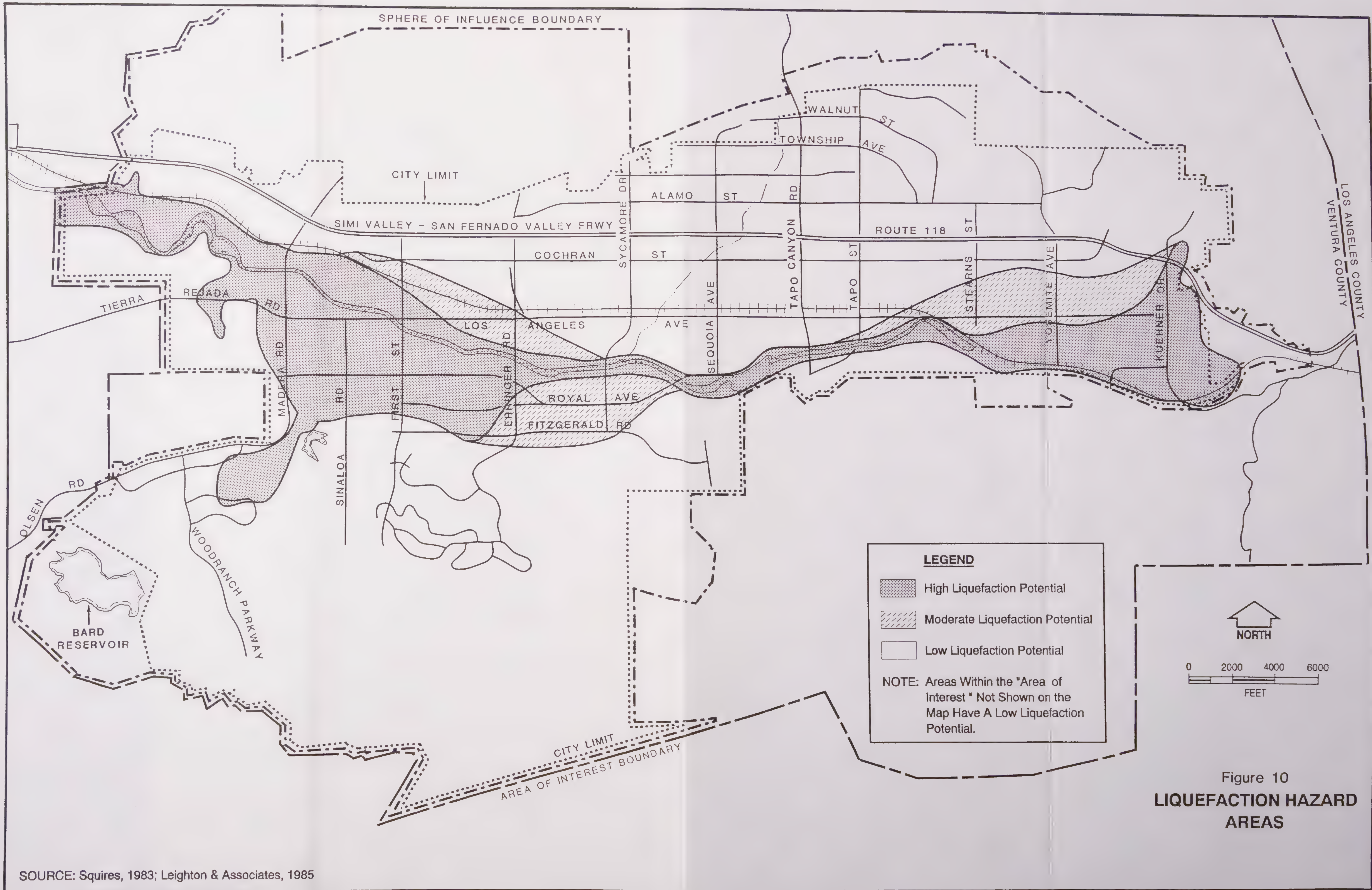


Figure 10
LIQUEFACTION HAZARD AREAS

SOURCE: Squires, 1983; Leighton & Associates, 1985

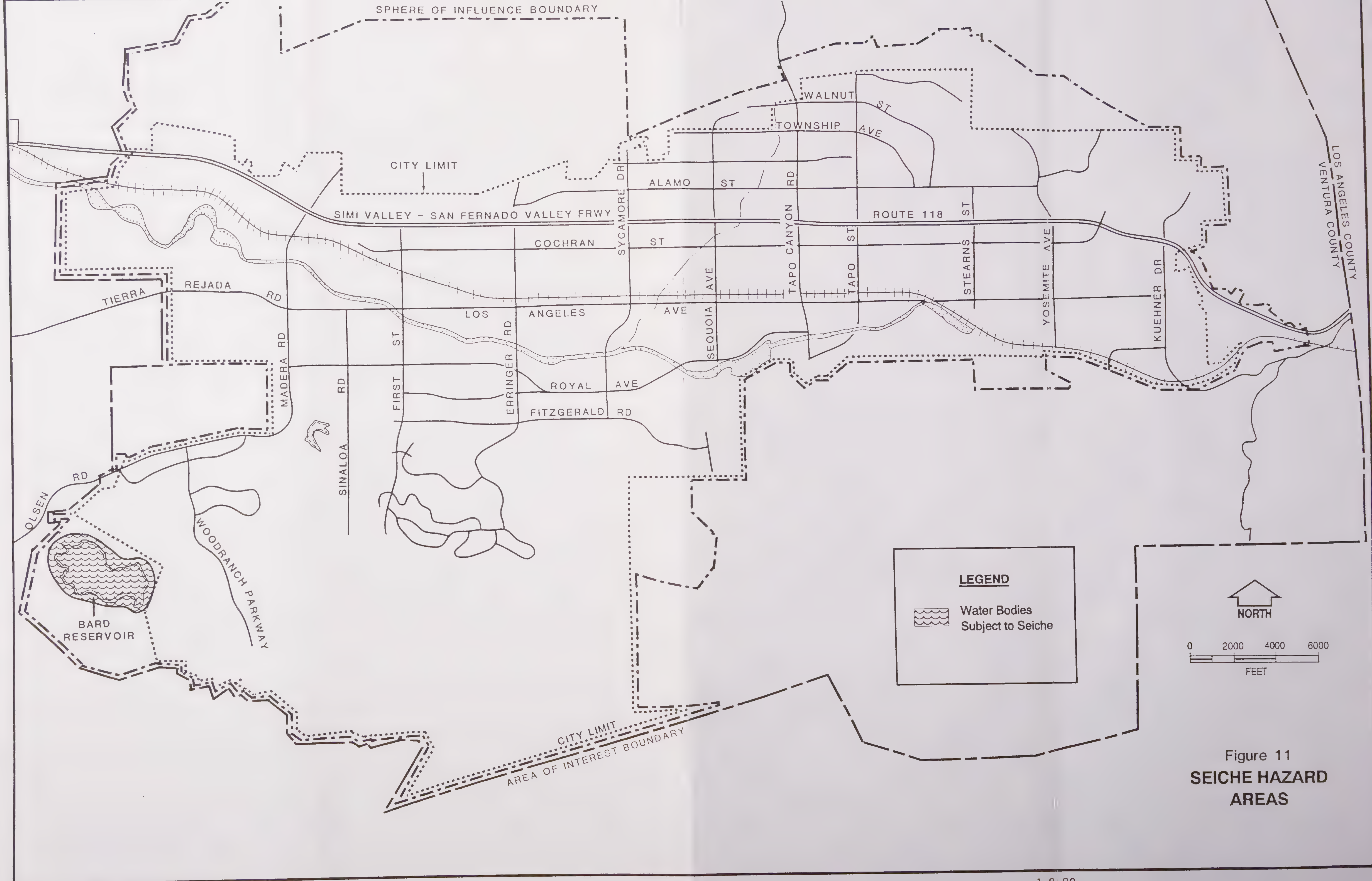


Figure 11
SEICHE HAZARD AREAS

McClelland consultants

B. SLOPE AND GROUND STABILITY HAZARDS

Certain slope and ground conditions can result in poor or unstable foundations and can pose significant hazards to structures and their occupants. Although unstable slopes are not directly related to seismic hazards, earthquakes can also trigger slope failures.

1. Landslides and Debris/Mud Flows

a. General Description. Landslides are characterized by failure along one or more definite shear surfaces. They are triggered by steepening of the slope, removing support from the toe of the slope, or adding load to the top of the slope. Slope modifications may be natural as by stream erosion or may be caused by man. Improperly controlled cut and fill operations associated with hillside development can lead to landslides. The ground shaking induced by earthquakes may trigger a slide.

Particle size is used to distinguish debris flows from mud flows. Mud flows contain at least 50 percent sand, silt, and clay size particles, whereas debris flows contain coarser particles (Transportation Research Board, 1978). Debris flows or mud flows may start as landslides and then develop into flows, which do not move along defined shear surfaces. Flows are composed of a high-density mixture of soil and water moving at a relatively high speed which has the ability to move cars and destroy structures in its path. Areas prone to debris/mud flows typically have a thick mantle of loose soil, a steep slope, and are subjected to infrequent, heavy rains. Debris/mud flows often originate in canyons or hillside areas that have been burned by fire.

Landslides and debris/mud flows are part of the continuous, natural process of the downhill movement of soil, rock, and rock debris. The speed at which the earth material moves downslope can range from imperceptible creep of soil and rock material to sudden mass movements of an entire hillside. Debris/mud flows are a particularly destructive form of downslope movement that can be prevalent after brush and wildfires. Composed mostly of a viscous mixture of unconsolidated material and water, debris/mud flows can spread over wide areas and move greater distances than other types of downslope movements. Slides and flows are

natural phenomena and occur with or without human activity. Human interference, however, can often increase the frequency and extent of the slope and ground stability hazards.

Landslides and debris/mud flows result from the relationship between forces that tend to make earth material slide (driving forces) and forces that tend to oppose such movement (resisting forces). Driving forces acting on a slope are the weight of the slope material and the weight of objects placed on or in the slope, such as water, buildings, artificial fill, swimming pools, etc. Resisting forces are supplied mainly by the shear strength of the slope material, or the ability of the slope to support its own weight and resist the forces of gravity that try to pull it downhill. Resisting forces can be lowered most readily by the addition of water to the slope, as water will add excess weight to the slope material and will facilitate movement by decreasing the strength of soil along the slip plane.

Methods to control landslide movement can include: dewatering the hillside, buttressing the slide, or actually removing the unstable earth material. Debris flows can be controlled by the use of debris basins, debris fences, and deflection walls.

b. Effects of Landslides and Debris/Mud Flows. Slope instability that results in landslides and debris/mud flows can cause substantial damage and disruption to buildings and infrastructure. Some of these losses can include possible loss of life; displacement and destruction of buildings, roadways, and other improvements; blockage of drainage channels; disruption of transportation and communication systems; and the loss and disruption of utilities and pipelines.

A secondary effect of the landslide and debris/mud flow hazard are potential lawsuits initiated against the developer, the present property owners, and/or the governmental agencies that may have reviewed the development, approved the plans, and issued the grading and/or building permits.

c. Inventory of the Local Landslide and Debris/Mud Flow Hazard. Most of the developed portions of the City are relatively flat and are not subject to a

significant landslide hazard. The hillside areas located north of Route 118 in the foothills of the Santa Susana Mountains and south of Royal Avenue in the Simi Hills contain many landslides and are likely to experience future landslide activity.

Landslides in the hillside areas of the City were mapped by the California Division of Mines and Geology (CDMG) as part of the State Landslide Hazard Identification Program. Figures 12a and b depict landslide hazards in the Simi Valley area. Since Figures 12a and b are generalized, the CDMG maps should be consulted for more detailed mapping. High landslide susceptibility areas are characterized by steep, unstable slopes which are naturally subject to failure, even without man's influence. Most existing landslides and downslope creep areas are included in the high susceptibility zone. Slopes within the medium landslide susceptibility areas are characterized by weak materials and steep slopes with no existing landslides. However, modification of the slopes is likely to trigger slope failure. Low landslide susceptibility areas have flat to moderately sloped topography. Landslides are unlikely because of the lack of a driving force (topography is too flat) or the presence of competent material. The Sespe, Santa Susana, Llajas, and Modelo geologic formations, which comprise the majority of the hillsides in the area, are known to be subject to landslides. Remaining hillside areas are considered somewhat less prone to landsliding although landslides may be triggered if slopes are modified.

Figure 13 depicts generalized debris/mud flow hazards in the Simi Valley area. The 1990 CDMG debris flow susceptibility map should be consulted for more detailed information. The term "debris flow" also includes mud flows. Areas within the high debris flow susceptibility zone show evidence of debris flow activity and contain the necessary combination of steep slopes, drainages (swales, ravines, canyons), and abundant source material. Moderate debris flow susceptibility areas have little evidence of debris flows and few drainages where loose, unconsolidated source material may collect. Flat to gently-sloping areas are within the low debris flow susceptibility zone. Debris flows are unlikely in these areas.

Another potential slope instabiity hazard in Simi Valley is rock falls. Rock falls occur in areas underlain by fractured rock in areas characterized by fairly steep topography. They are often triggered by earthquakes or heavy rains. The Chatsworth formation in the eastern part of the Valley and Conejo volcanics in the western part of the valley are prone to rock falls.

d. Local Resources Affected by Landslide Hazard. The hillside areas in the landslide hazard zone are presently largely undeveloped except for a few extensions of residential development into the foothills. As development moves into the hillside areas, more structures will be exposed to potential landslide and ground failure hazards, unless the site geology is properly investigated, the site is properly graded, the site foundation is properly designed and prepared.

2. Settlement

a. General Description. Settlement is a localized lowering of the ground surface due to a decrease in the volume of the underlying soil. Several different settlement processes are discussed below:

- Consolidation. Consolidation is a slow process by which water is squeezed out of a clay soil allowing clay particles to rearrange into a denser structure. Consolidation can be caused by the weight of a building, the weight of fill material, or some other load at the ground surface. The process of consolidation also occurs naturally due to the weight of the overlying material.

- Soil Collapse. The sudden decrease in volume of a soil deposit upon the addition of water is called soil collapse, hydroconsolidation, or hydrocompaction. Soil collapse typically occurs in loosely-structured, dry silts or sands that have been deposited in an arid to semi-arid climate. The sand or silt grains are held together in a loose structure by clay, calcium carbonate, or other cementing agent. By adding water, the cement bonds are weakened and the soil can collapse under its own weight or under the weight of a building or fill material.

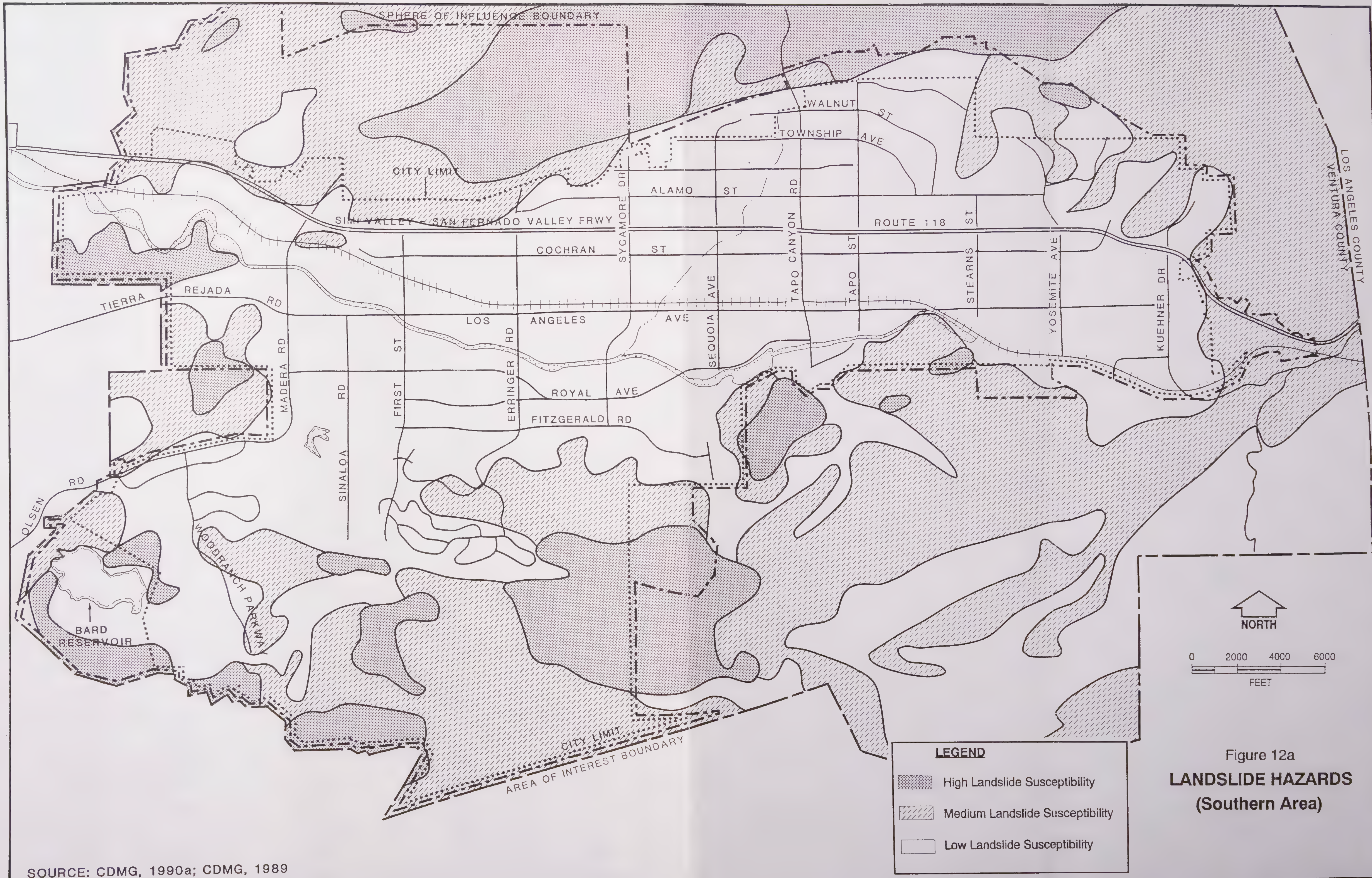


Figure 12a
LANDSLIDE HAZARDS (Southern Area)

SOURCE: CDMG, 1990a; CDMG, 1989

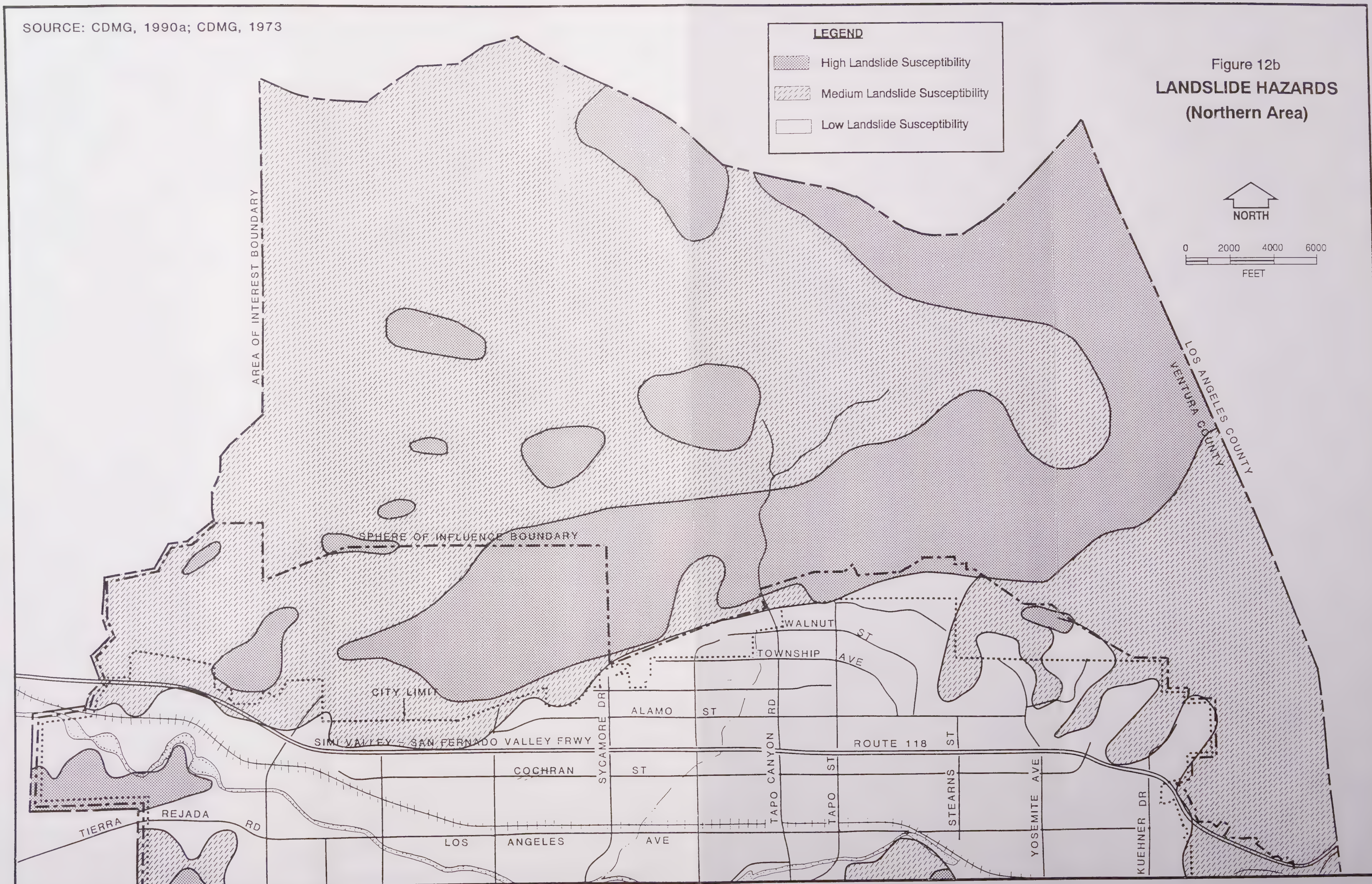


Figure 12b
LANDSLIDE HAZARDS
(Northern Area)

McClelland consultants

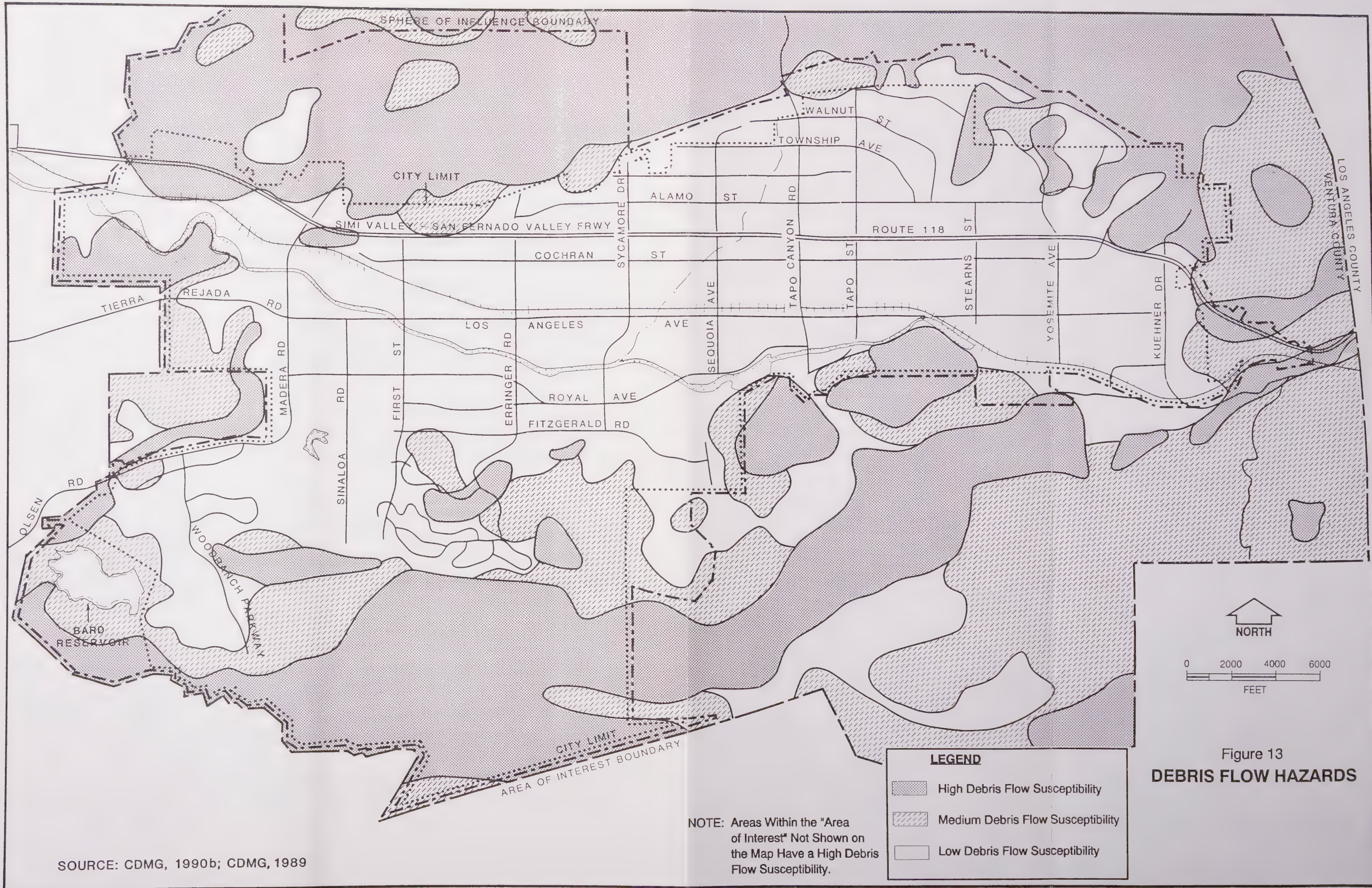


Figure 13
DEBRIS FLOW HAZARDS

NOTE: Areas Within the "Area of Interest" Not Shown on the Map Have a High Debris Flow Susceptibility.

SOURCE: CDMG, 1990b; CDMG, 1989

- Seismic/Vibration Compaction. When a loose, dry sand material is subjected to vibration from machinery or an earthquake it will tend to decrease in volume. The sand grains tend to rearrange into a denser structure during shaking resulting in settlement of the ground surface.

- Peat Oxidation. Peats are organic soils that form in a marsh-type environment. A rapid accumulation of plant debris in the marsh prevents oxygen from decomposing the organic material before it is buried. When peat is later exposed to oxygen it decays and decreases in volume resulting in settlement.

b. General Effects of Settlement. Settlement due to consolidation of clays and oxidation of peat usually occurs gradually over a period of time. Collapse and seismic/vibration compaction can occur suddenly and rapidly.

Settlement can result in structural damage especially when settlement is greater under one portion of a structure than under another portion (differential settlement). However, settlement can be minimized if soils are compacted or otherwise improved.

c. Inventory of the Local Settlement Hazard. Saturated clays prone to consolidation settlement may be found in the alluvium underlying most of the Simi Valley. Since the groundwater level in the past was much lower than the present level (Leighton & Associates, 1985), the clays probably have already consolidated to some extent.

Soil collapse is unlikely in the western and eastern parts of the Simi Valley where the high water table would have exposed any collapse-prone soils to wetting and subsequent collapse. Areas on alluvial fans or debris flow deposits adjacent to the hills, which have not been wetted in the past, could be prone to collapse. Collapsible soils have been found in the Tapo Canyon area (Tom Blake, personal communication). Figure 14 outlines areas potentially affected by collapsible soils. The map outlines areas at the mouths of canyons which may be underlain by alluvial fan or debris flow deposits where the water table is greater than about 40 ft.

Settlement due to seismic/vibration compaction of loose, dry sands is unlikely in the Simi Valley where the water table is near the surface in the western and eastern parts of the city. Loose, dry sands may be present in the alluvium in the central portion of the valley.

Settlement resulting from the oxidation of peat may occur in western Simi Valley. Presently, and at various times in the past, the water table was at or near the ground surface in western Simi Valley resulting in marshy conditions. A 25-foot layer of very soft, peat-like material was found by cone penetration testing at the K-Mart site in Simi Valley (Geolabs, 1983). Known marshy areas include the Greek Tract housing development at Madera Road and Los Angeles Avenue, the temporary "Simi Valley Days" site south of Los Angeles Avenue at Madera and Sinaloa Roads, and the area west of Madera Road between Arroyo Simi and the Southern Pacific Railroad near Chain Drive (Dr. Michael Kuhn, personal communication).

Figure 14 does not include boundaries for areas potentially affected by consolidation settlement or seismic/vibration compaction, because these areas can not be defined based on geology or groundwater conditions alone. Collapse-prone soils and peat deposits occur in more restricted geologic and groundwater settings and can, therefore, be generally outlined. A site specific soils investigation will be required for all new development within Simi Valley to define settlement prone areas; however, Figure 14 indicates areas most likely to have collapsible soils or peat deposits.

3. Subsidence

a. General Description. Subsidence is the gradual lowering of the ground surface elevation over a wide area often due to the withdrawal of fluids such as water, oil, and gas from the subsurface. As fluids are removed from the subsurface reservoir or aquifer, the weight of the overburden, which the water had previously helped support through buoyant forces, is placed on the soil structure. The soil structure compresses into a smaller volume and causes a lowering of the ground surface.

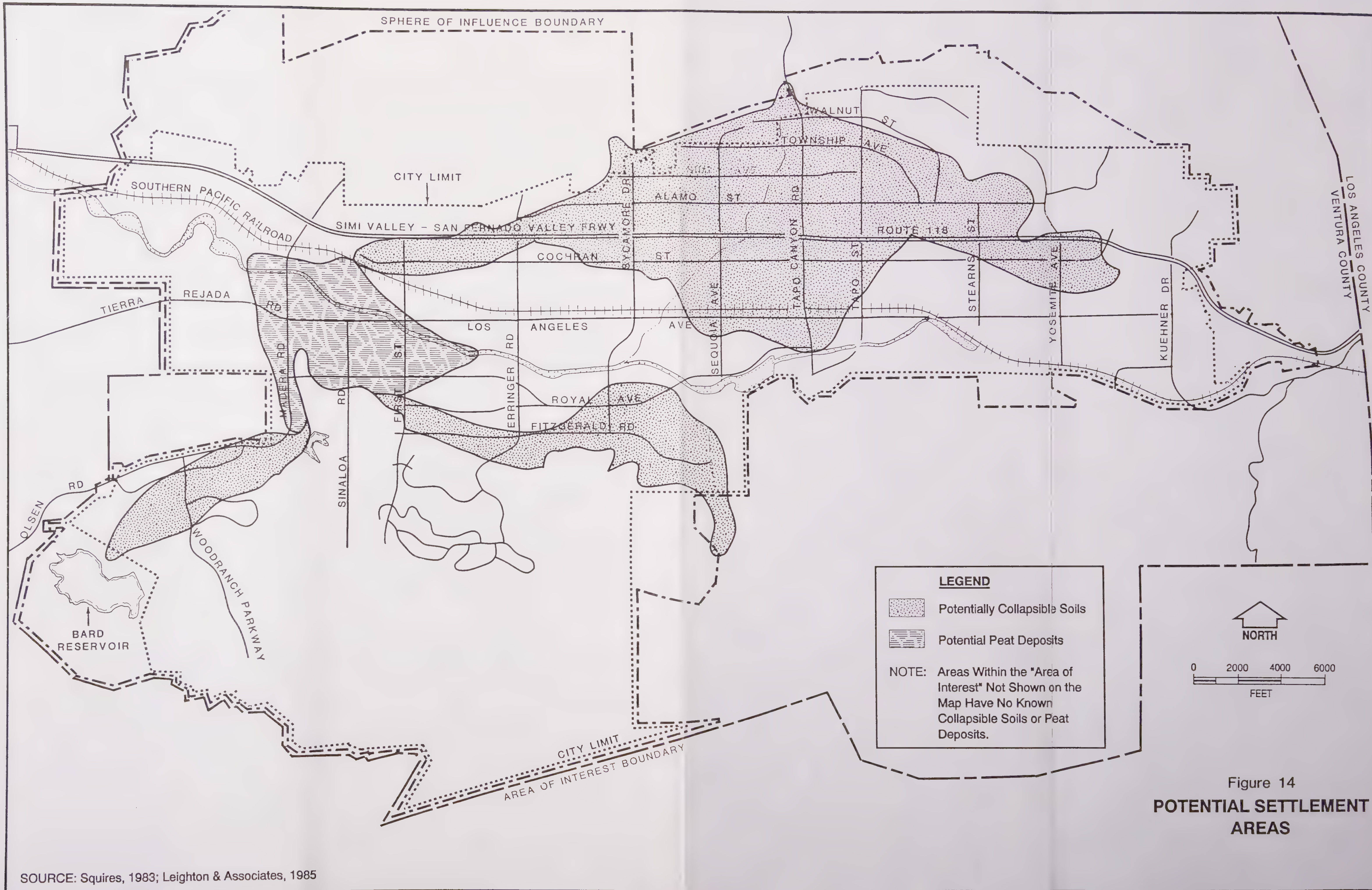


Figure 14
POTENTIAL SETTLEMENT AREAS

SOURCE: Squires, 1983; Leighton & Associates, 1985

A 1977 California Division of Oil and Gas report noted that the Oxnard Plain has subsided up to 2 ft since 1920 partially due to groundwater withdrawal and oil extraction. Oil extraction has resulted in the greatest subsidence on record in California. In the Wilmington Oil Field, near Long Beach, a maximum subsidence of 29 feet was recorded in the period 1928 to 1972.

b. General Effects of Subsidence. The damage caused by subsidence is generally not of an immediate or violent nature. The compaction of alluvium and settling of the land surface is a process that occurs slowly over many years.

Subsidence that results from groundwater or oil and gas withdrawal can be responsible for numerous structural effects. Most seriously affected are long, surface infrastructure facilities that are sensitive to slight changes in gradient. This includes canals, sewers, pipelines, and drains. Lowering the ground surface elevation also may result in increased flooding.

c. Inventory of the Local Subsidence Hazard. The Simi Valley area is not likely to experience significant amounts of subsidence due to the withdrawal of water or oil and gas. No regional subsidence was recorded in the past when groundwater levels were lowered by pumping. Water levels now are higher than in the past since pumping activity has been curtailed. Oil and gas are being removed from local bedrock areas such as the Sespe, Llajas, and Santa Susana Formations, which may be prone to compaction due to fluid withdrawal. These bedrock areas are primarily open space, therefore, localized subsidence would not adversely affect any structures.

d. Local Resources Affected by Subsidence. Property damage due to subsidence occurs over a long period of time. Drainage courses, wells, and utility lines are potentially the most vulnerable to damage. Subsidence can be mitigated, however, by replacing the fluid being withdrawn with another fluid. For example, water can be injected into the subsurface reservoir to replace oil or gas being removed.

4. Expansive Soils

a. General Description. Expansive soils, or soils that are referred to as having a high shrink-swell potential, are those soils that are generally clayey, expand or swell when wetted, and contract or shrink when dried. Wetting may be by absorption of moisture from the air, rainfall, groundwater fluctuations, lawn watering, broken water, sewer lines, etc.

In hillside areas, as expansive soils expand and contract, a gradual downslope movement or creep of the soil material is common. The downward soil movement may eventually result in a landslide. Clay soils also retain water and may act as a slippage plane between other soil/rock strata, resulting in a landslide. Slope failures along expansive clay beds are common in the Sespe Formation. Landslides due to failure along a clay bed can be triggered by earthquakes or by unusually wet conditions.

Expansive soil conditions can usually be reasonably mitigated by proper foundation design. However, construction costs increase as the extent and/or expansiveness of the material increases. In combination with unstable slopes, expansive soil conditions can pose a significant development hazard.

b. General Effects of Expansive Soil. When structures are placed on expansive soils, foundations may move as the soils absorb water and swell or may dry out and shrink. Movements may vary under different parts of a structure so that foundations, floor slabs, walls, and ceilings crack, various structural portions of the building are distorted, and doors and windows are warped. Signs of soil creep on slopes can be seen in such features as curved trees and tilted fence posts and telephone poles.

c. Inventory of the Local Expansive Soil Hazard. Based on the U.S. Soil Conservation Service (1970) soils maps, several zones of highly expansive soils are present in the foothills of the City. The Santa Susana, Llajas, Sespe, Modelo, Conejo volcanics, and older alluvium may develop or include areas of highly expansive soils. Most of the remaining areas of the City are rated as having moderately expansive soil. Figure 15a and 15b depict approximate expansive soil zones throughout the City. Site-specific soils investigations

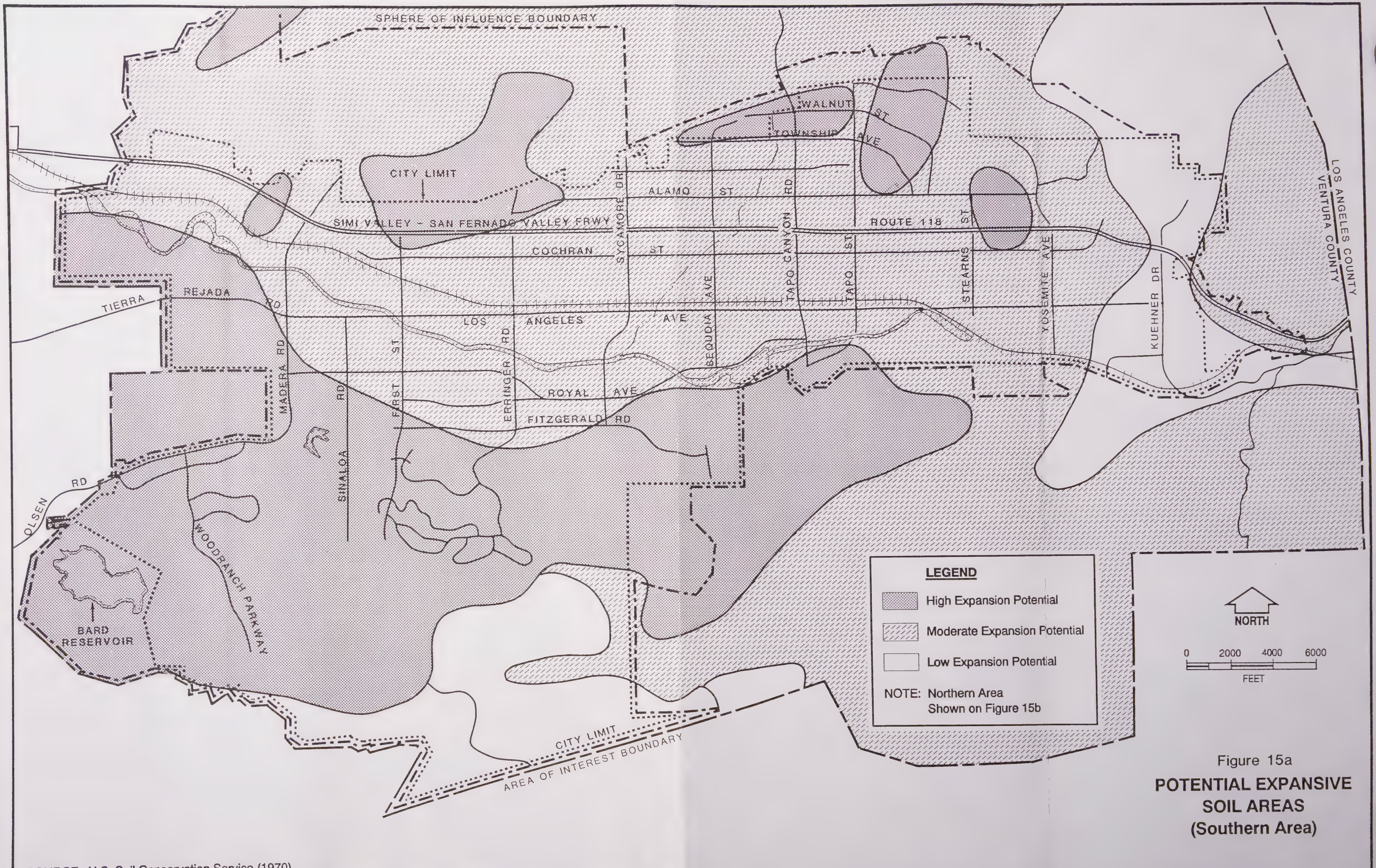
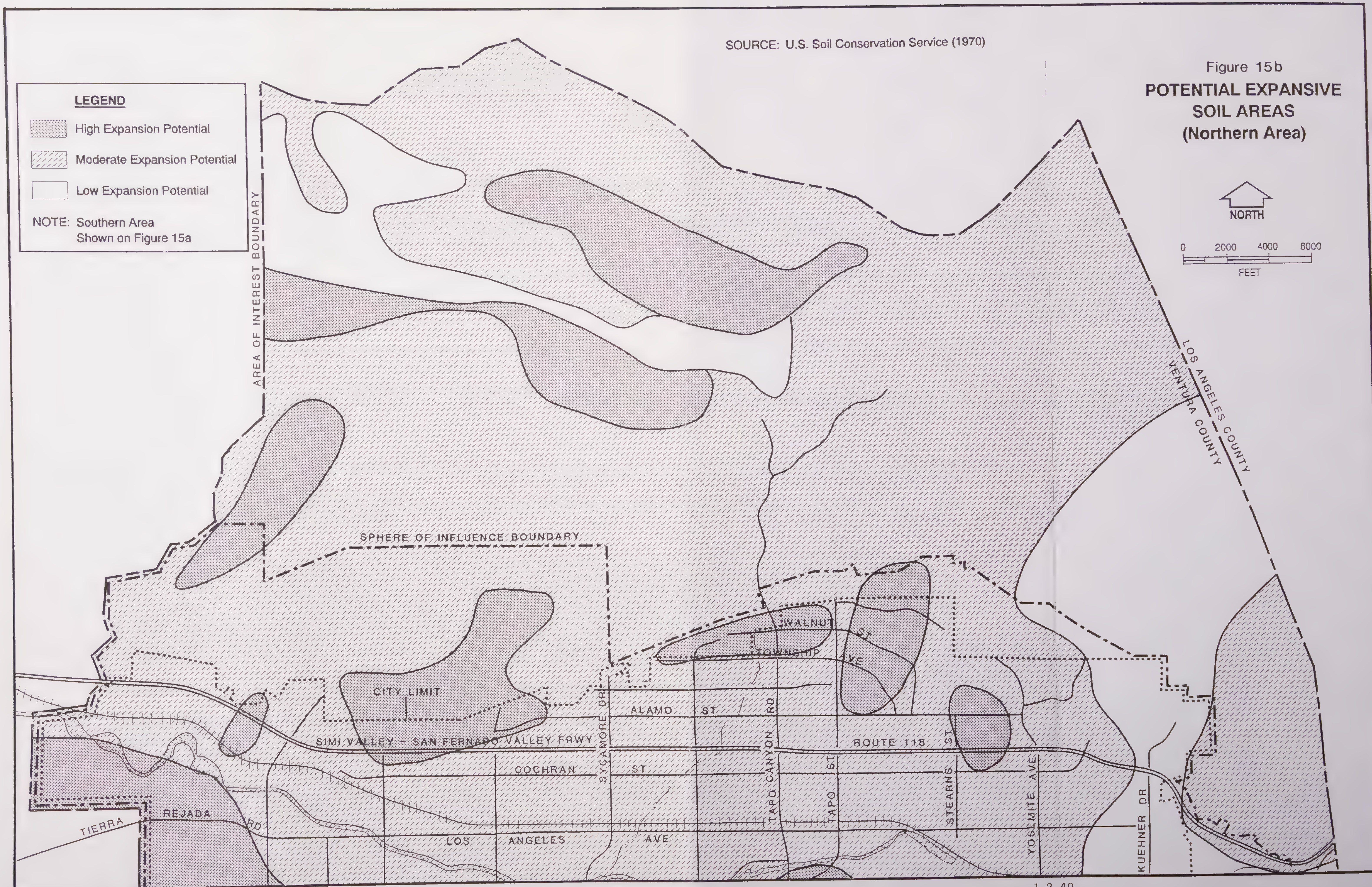


Figure 15a
POTENTIAL EXPANSIVE SOIL AREAS (Southern Area)

SOURCE: U.S. Soil Conservation Service (1970)



McClelland consultants

will be required for all new development, within all soil zones; however, the map indicates areas most likely to have expansive soils.

As development occurs in the foothill areas of the City, more structures will be exposed to potentially damaging expansive soil or soil creep conditions. Continued enforcement of existing building codes and grading criteria, however, should mitigate this hazard. However, expansive soils can lead to distortion and cracking of patios, driveways, and fences/walls which are not regulated by the building codes.

BLANK PAGE TO END SECTION

C. WATER HAZARDS

Water-related hazards in Simi Valley include flooding and dam failure. Potential water-related hazards are described below:

1. Flooding

a. General Description. A flood may be defined as a temporary rise in stream flow that results in water overtopping the stream banks and inundating areas adjacent to the channel. The floodplain is the relatively flat, lowland area adjoining the stream that is subject to periodic inundation by floodwater.

The magnitude of a flood is measured in terms of its peak discharge, the maximum volume of water (in cubic feet per second) passing a point along the channel. Floods, however, are usually described in terms of their frequency of occurrence. For example, the 100-year flood is the flood magnitude that has a one-percent chance of being equalled or exceeded in any given year. There is a certain element of risk involved in using this type of designation; the prediction of a flood of a particular magnitude is based on probability. According to statistical averages, a 25-year flood should occur on the average of once every 25 years, but two 25-year floods could conceivably occur in any one month or year. For planning purposes, the flood magnitude most often used to delineate floodplain boundaries is the 100-year flood.

Flooding is a direct response to the amount, distribution, and intensity of precipitation and characteristics of the drainage area. Most storms are relatively small and do not seriously disrupt people and the land on which they live. Occasionally, however, a storm of great magnitude or a series of large storms will cause serious damage and disruption to the landscape and its inhabitants. The relationship between great storms and their rates of occurrence is known as the magnitude-frequency concept. The magnitude of an event refers to its size (the height of flood waters), and the frequency refers to the number of times a given event occurs during some specified time period. Fortunately, magnitude and frequency are inversely related (i.e., events of great magnitude and force occur infrequently and vice versa).

Flooding is a naturally occurring event with some long-range beneficial effects, such as the replenishment of beach sand and nutrients to agricultural lands and the ocean. Flooding is a hazard because people have inhabited floodplains which are flat, fertile lands and convenient and desirable places to live. A dangerous misconception about the flooding hazard is that once a major flood (such as a 50-year or 100-year flood) has been experienced, the area flooded is safe for another 50 or 100 years. Often, in areas where rapid urban development is taking place, quite the opposite is true; the potential for more frequent floods is created due to increase rate and quantity of runoff. As mentioned earlier, flood probabilities are based on statistical averages of data from historical events and are therefore not infallible.

b. Effects of Flooding. The extent of damage caused by any flood depends on the topography of the area flooded; depth and duration of flooding; velocity of flow; rate of water rise; the extent of development and land use on the flood plain; the sediment load deposited by the flood; and the effectiveness of forecasting, warnings, and emergency operations.

Primary effects of flooding include injury and loss of life; damage to structures caused by swift currents, debris, and sediment; disruption of communication and transportation facilities; severe erosion; loss of vegetation and crops from sediment deposition; health hazards from ruptured sewage lines and damaged septic tanks; and the disruption of utilities and vital public services.

Secondary effects of flooding place a burden on local and national taxpayers and resources. Evacuation relief and flood-fighting services, clean-up operations, and the repair of public facilities are paid for by the public. The construction and maintenance of flood prevention and control facilities are also paid for by taxpayers.

c. Influences on Flooding Impact. The magnitude and frequency of flooding events can be influenced by many factors. Natural and artificially-induced changes to the characteristics of the drainage basin and flood plain of a stream can have profound effects on the extent and severity of any particular flood.

The growth of brush and trees within the flood plain can act as natural obstructions to floodwater flow, thereby increasing backwater floodwater heights. Flood heights may also be naturally increased if a watershed is burned, resulting in greater storm runoff and sediment production. Also, if previous rainfall has saturated the ground, runoff and flood heights are greater because the ground cannot absorb additional moisture.

Urban development is perhaps the most serious artificially-induced change in drainage basin and flood plain characteristics that can influence the magnitude and frequency of flooding. Urbanization leads to a greater percentage of impervious ground surfaces (i.e., pavement, concrete, rooftops, etc.), which tend to increase the total volume of storm runoff by decreasing the amount of water that infiltrates into the ground. Impervious surface material will also decrease the lag time between when the rainfall hits the ground and when it collects to be carried away by streams, storm drains, and flood control channels, etc. The combined effect of increased runoff and a decrease in lag time will cause more frequent and severe floods. Urban development can also result in structures, artificial fill, solid masonry walls, and other objects being placed on the flood plain. This reduces the space available for storing floodwaters, causing the water level and rate of flow to increase. Bridges and other stream crossings also serve as flow obstructions as brush, trees, and other debris may collect against the bridges. As floodflows increase, masses of debris may break loose, sending a wall of water surging downstream; or the debris may have a damming effect until the pressure of the water exceeds the structural capability of the bridge and the bridge washes away.

To protect urban development from the impacts of flooding, stream channels are often channelized (straightened, lined, etc.) to move the water off the land more efficiently. However, when water emerges from the channelized section of the stream, it is often delivered to the unchannelized downstream section at rates and velocities the natural section of stream is not capable of adequately carrying. Piecemeal channelization efforts often increases the flooding potential downstream.

d. <u>Inventory of the Local Flood Hazard</u>. Simi Valley is within the Calleguas Creek watershed. Calleguas Creek is known as Arroyo Simi in Simi

Valley. Damage to the Calleguas Creek watershed due to flooding has historically been less than in other areas of the county. The largest flood recorded in Simi Valley occurred on March 1, 1983, with a peak discharge, Q, of 10,700 cfs at the Madera Road Station. Other major storms occurred in 1969 (Q = 6,330 cfs), 1970 (Q = 5,210 cfs), 1978 (Q = 7,730 cfs), 1979 (Q = 4,050 cfs), and 1980 (Q = 9,310 cfs) (FEMA, 1985). The increased peak discharges of the more recent storms are probably due to the increased runoff due to urbanization of the Simi Valley.

Damage from the major floods was mostly limited to the drainage channels; only minor damage occurred due to inundation. High channel flows resulted in undermining of bank protection and stabilizers in Arroyo Simi, erosion around bridge abutments and piers, and erosion of the Arroyo Simi channel (VCFCD, personal communication).

Figure 16 depicts areas in the City subject to inundation by the 100-year flood, as shown on the final Flood Insurance Rate Maps (FIRM), adopted September 27, 1991. The FIRM maps are compiled for the Federal Insurance Administration to implement the National Flood Insurance Act. The official FIRM maps should be consulted when assessing potential flood hazards at a particular property.

e. Local Resources Affected by Flood Hazard. The Flood Insurance Rate Maps (FIRM) maps are now available in final form. The final maps now become an appendix to this Safety Element, by reference. Information on flood hazards is available from the City Department of Public Works.

Although structural flood control measures are perhaps some of the most feasible solutions to protect existing development in a flood prone area, limiting new development in a flood plain would assure minimal risk, damage, and alteration of a natural drainage course, and conditioning development approvals to require raising building pads above the 100-year storm water levels.

2. Dam Inundation

a. General Description. Dam inundation is the flooding of lands due to the failure or overtopping of a dam. Dam failures can result from a number of

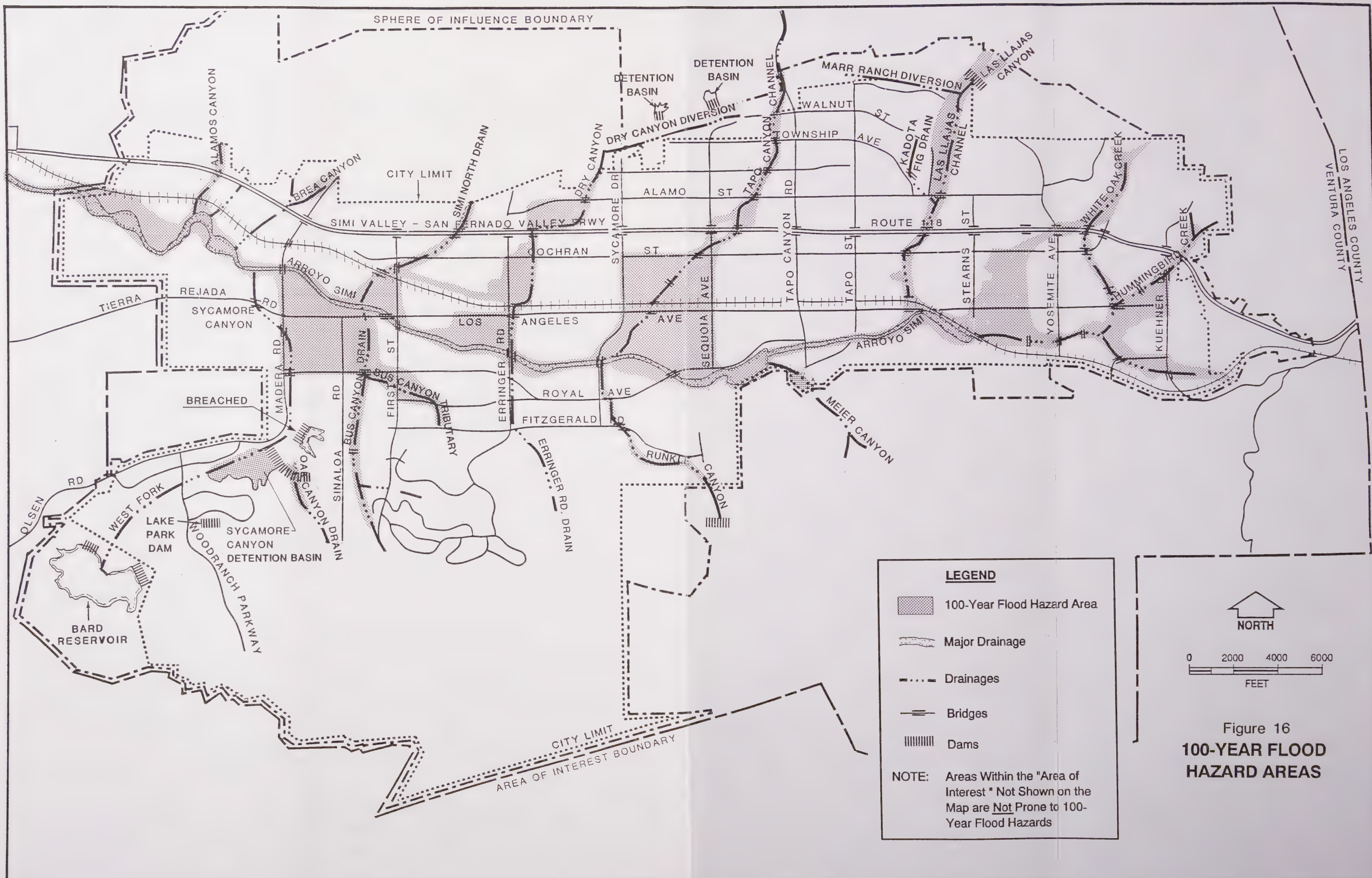


Figure 16
100-YEAR FLOOD HAZARD AREAS

natural or man-made causes such as earthquakes, erosion of the face or foundation of the dam, improper siting, rapidly rising flood waters, and structural design/construction flaws.

There are three general types of dams: earth, rockfill, and concrete. Earth dams can be "compacted" or "hydraulic fill", rockfill dams can be "clay core" or "concrete-faced", and concrete dams can be "gravity", "arch", or "buttress".

Dam failures can result from erosion of the dam, liquefaction within the dam or within the dam foundation, erosion of the dam abutment or foundation, structural failure of the dam, or overtopping. Earth dams can fail by seepage, piping, and erosion along zones of weakness such as open cracks or pervious zones until the dam is breached. All three dam types can fail by erosion of the abutment or the foundation, by structural failure of the dam, or by overtopping. The hydraulic fill Van Norman Dam in the San Fernando Valley almost failed due to liquefaction of a portion of the dam during the 1971 San Fernando earthquake. In Italy in 1963, the concrete Vaiont Dam was overtopped when a large landslide into the reservoir displaced a large wave of water over the top of the dam. Factors leading to failure of the St. Francis Dam in Ventura County in 1928 included erosion along a fault in the dam foundation, erosion around an abutment due to softening of supporting rock, and landsliding into the reservoir along schistose rocks which dipped out of the slope. The St. Francis Dam was not properly sited based on geologic conditions.

The characteristics of the downstream flood wave depend on the mode of failure of the dam. Erosion of the dam, dam abutment, or dam foundation will typically cause a flood wave which gradually builds to a peak and then declines when the reservoir is emptied. Structural failure of the dam or overtopping can result in a flood wave with a very rapid peak followed by a gradual decline. Often dam failure is due to several factors and the flood wave is intermediate between the cases described above.

Because potential dam failures affect the safety of many communities, inundation maps for all major dams must be prepared by the dam operators pursuant to Section 8589.5 of the California Government Code. The maps are a mandatory

consideration in the Safety Element. Based on the dam inundation maps, emergency evacuation plans for the affected local jurisdictions are prepared.

The State Division of Safety of Dams has a program by which dams are continually reviewed for safety including seismic stability. Existing dams are upgraded as new technology becomes available. New dams are required to incorporate the newest technology in the design in order to be certified as safe by the State.

b. Effects of Dam Failure. The failure of a large dam in Simi Valley would cause flooding, injury, possible loss of life, and property damage due to inundation, erosion, and debris and sediment deposition. Primary effects of the hazard include erosion; loss of vegetation and crops; disruption of communication and transportation facilities, utilities and vital public services; and health hazards from ruptured sewage lines and damaged septic tanks. Secondary effects include disaster relief, clean-up operations, and repair of public facilities, which place a burden on local and national taxpayers and resources.

c. Inventory of the Local Dam Failure Hazard. There are four dams that would have the potential to result in a significant inundation impact in Simi Valley. These dams include Wood Ranch, Sycamore Canyon, Las Llajas, and Runkle Canyon. Of these dams, only the Wood Ranch Dam permanently holds water in Bard Reservoir. General information for each of these dams is discussed below and is summarized on Table 4. Potential inundation areas and the locations of the dams are depicted on Figure 17.

- Wood Ranch Dam. Wood Ranch Dam is near the intersection of Olsen Road and the Moorpark Freeway (Route 23) at the head of Sycamore Canyon. The dam was completed in 1965. It is an earth dam, 146 ft high, and Bard Reservoir has a capacity of 11,000 acre-feet (Division of Dams and Safety). Wood Ranch Dam is the largest dam in the Simi Valley area; it is instrumented to measure movement, settlement, and seepage. Piezometers and observation wells are also monitored.

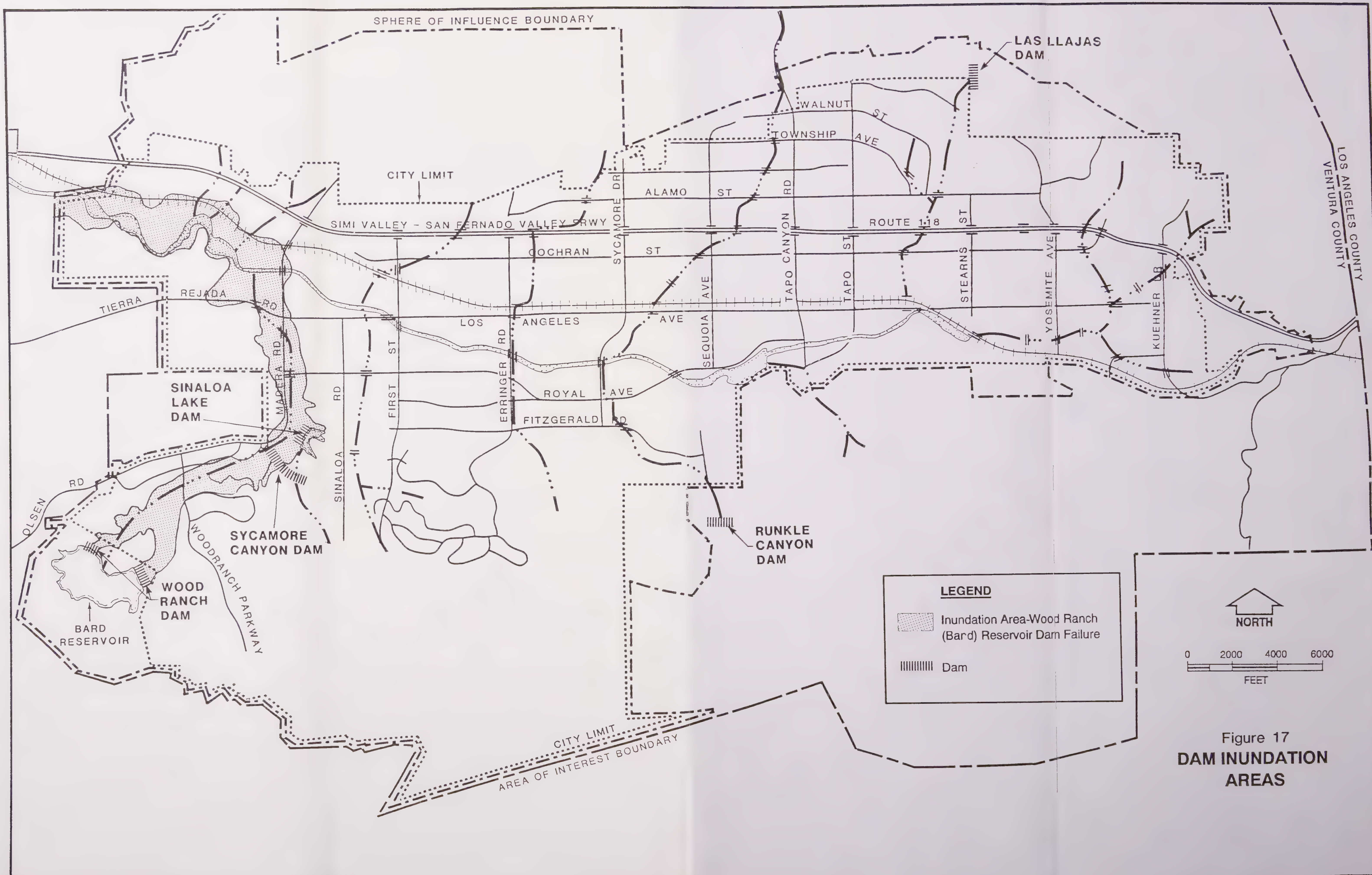


Figure 17
DAM INUNDATION AREAS

McClelland consultants

Table 4. Dams in the Simi Valley Area

Name	Type	Height (ft)	Capacity (acre-ft)	Year Built	Water	Instrumentation
Wood Ranch	Earth	146	11,000	1965	Yes	Yes - Movement and settlement, seepage, piezometers, observation wells
Sycamore Canyon	Earth	40	890	1981	No	No
Las Llajas	Earth	96	1,250	1981	No	No
Runkle Canyon	Earth	41	100	1949	No	Yes - Movement and settlement
Sinaloa Lake[1]	Earth	30	178	1925	No	--

[1]Breached.

- Sycamore Canyon Dam. Sycamore Canyon Dam is downstream from the Wood Ranch Reservoir near Sinaloa Lake. Construction of the 40-foot-high, 890 acre-feet capacity earth dam was completed in 1981. The dam is a flood control structure which detains but does not permanently hold water and it is not instrumented.

- Las Llajas Dam. The earth Las Llajas Dam was constructed in 1981 at the mouth of Las Llajas Canyon in northeastern Simi Valley. The dam has a height of 96 feet and a capacity of 1,250 acre-feet. It is a flood control structure which detains but does not hold water permanently and it is not instrumented.

- Runkle Canyon Dam. The earth Runkle Canyon Dam is 40 feet high with a capacity of only 100 acre-feet. It was completed in 1949, about 1/4 mile upstream from the mouth of Runkle Canyon. The dam does not permanently hold water but it is instrumented to measure settlement and movement.

- Sinaloa Lake Dam. Sinaloa Lake Dam, built in 1925, near the Sycamore Dam has been breached and no longer holds water. The dam was 30 feet high and had a capacity of 178 acre-feet.

d. Local Resources Potentially Affected by Dam Failure. The dam inundation maps prepared by the dam operators are intended as a worst-case scenario for use by local agencies for emergency preparedness in the event of unlikely disaster threatening dam failure.

Should the Wood Ranch Dam fail, areas which would be affected include portions of the Wood Ranch Golf Course, residential and commercial areas along Madera Road, Madera Elementary School, the Waste Water Treatment Plant, the Public Services Center, and portions of the Southern Pacific Railroad.

Inundation maps are not yet available for the Las Llajas and Runkle Canyon dams. According to the State Office of Emergency Services (Mr. Keith Harrison), the entire flow due to failure of the Runkle Canyon dam would be maintained within the flood control channel. Therefore, the Runkle Canyon dam is being

recommended for exemption from the required dam evacuation plan (Government Code 8589.5).

BLANK PAGE TO END SECTION

D. FIRE HAZARDS

The public is exposed to fire from two potential sources: urban fires and wildland fires. The potential risk from fire hazards is described below.

1. Urban Fires

a. General Discussion. Fire suppression and prevention services within Simi Valley are provided by the Ventura County Fire Protection District. In 1990, 21 members of the Ventura County Fire Protection District were assigned to Simi Valley. Five fire stations are located throughout the City (see Figure 18). Table 5 summarizes information about each station.

b. Need for New or Upgraded Facilities. The Fire Department's goal is to ensure equal emergency response times to all areas of the City. Ideally, the maximum distance to a fire station should not exceed 3 miles; however, this goal has not yet been met. The measurement of response time is not entirely related to the distance, since traffic conditions and emergency ingress and egress capability can also influence response times. Test runs throughout the City are conducted to more accurately document actual travel times within a particular fire station's response area. When new developments are built, test runs determine the need to redefine response areas or the need for new fire stations.

A new fire station (Station No. 44) is located at Olsen Road and Country Club Drive. This station has been in service since March, 1991. As new development continues in other parts of the City, additional fire stations may be required, as identified in the Simi Valley General Plan Update (October 1988).

Several existing fire stations may need to be upgraded to meet seismic structural codes. Fire stations are critical facilities that must be functional after an earthquake or other disaster to prevent additional loss of property and life. Station Nos. 43, 45, and 46 were constructed in 1950, 1960, and 1965, respectively, when building codes did not include stringent seismic structural

Figure 18. KEY

Areas of Potential High Loss of Life from Fires

1. Clarion Inn
2. Radisson Hotel
3. Travelodge of Simi Valley
4. Hallmark Nursing Center
5. Royal High School Theatre
6. Regional Mall Theatres (proposed)
7. Sycamore Plaza Mann Theatres
8. Simi Valley Library
   Senior Citizens Center
   Civic Center
9. Adventist Hospital
10. Mountain Gate Plaza Theaters (proposed)
    Home Club Plaza Theatres (proposed)
11. Simi High School Theatre

Areas of Potential Large Property Loss from Fires

1. Bugle Boy Industries
2. Los Angeles Avenue/Peppertree Complex
3. Farmers' Insurance Regional Office
4. Easy Street Complex
5. Moreland/Union Complex
6. Simi Valley Regional Shopping Center (proposed)
7. Sycamore Plaza
   Target Center
   Mervyn's Center
8. Civic Center
9. Adventist Hospital
10. Mountain Gate Plaza
    Home Club Plaza

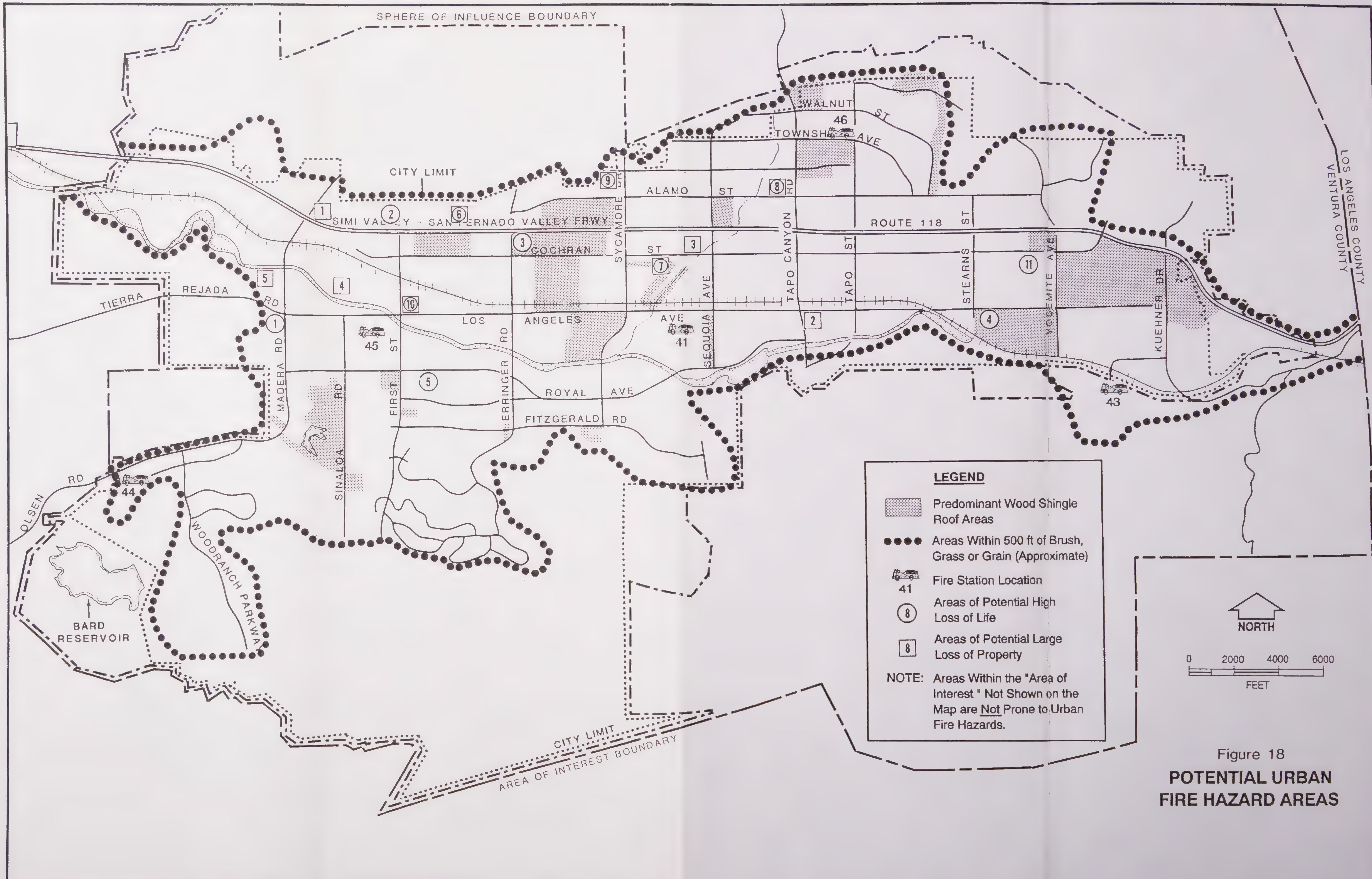


Figure 18
POTENTIAL URBAN FIRE HAZARD AREAS

Table 5. Information on Simi Valley Fire Stations

Station No.	Year Built	Location	No. of Personnel	Equipment
41	1988	1910 Church Street	1 Battalion Chief 2 Captains 3 Engineers 3 Firefighters	1 Engine 1 Ladder Truck
43	1950	1262 Cypress Street	1 Captain 1 Engineer 1 Firefighter	1 Engine 1 Brush Engine
44	1990	2201 East Olsen Road (under construction; temporary facility is to the east)	1 Captain 1 Engineer 1 Firefighter	1 Engine
45	1977	790 Pacific Avenue	1 Captain 1 Engineer 1 Firefighter	1 Engine
46	1965	3265 North Tapo Street	1 Captain 1 Engineer 1 Firefighter	1 Engine

requirements. Therefore, these older fire station buildings may be subject to significant earthquake damage. Although no building should be considered earthquake-proof, Fire Station Nos. 41 and 44 were constructed in 1988 and 1990 and have incorporated newer and much more stringent structural requirements to resist possible earthquake damage.

The County of Ventura is in the process of prioritizing and finding a contractor for the structural engineering evaluation of fire stations built prior to seismic structural requirements. Station Nos. 43, 45, and 46 would be evaluated under this program.

c. Inventory of the Urban Fire Hazard. Within the last 10 years, the number of fire-related calls has steadily decreased whereas the number of non-fire-related calls has increased. Non-fire-related calls include medical emergencies (heart attacks, illness, injury aid, assistance to the elderly/invalid, etc.) and service calls (electrical hazards, hazardous material leaks or spills, rescues, washdowns, etc.). Fire prevention activities such as the installation of smoke detectors, the County fire retardant roofing and sprinkling ordinances, and the support and assistance from local citizens can be credited for the decrease in fire-related calls.

d. Local Resources Affected By Urban Fire Hazard. The risk of life or property loss resulting from fires in urban settings is influenced by a variety of factors. Some factors include building construction materials, the type of occupancy and the type of items stored within the structure, fire response time, the availability of adequate fire flows of water and adequate emergency ingress and egress. The following paragraphs discuss the various factor which influence the urban fire hazard.

Residential neighborhoods with large concentrations of houses with wood shingle or shake roofs are at a greater fire risk than neighborhoods where the majority of the residences utilize fire retardant roofing material. Figure 18 depicts areas throughout the City that have large concentrations of residences with wood shingle/shake roofs.

Figure 18 identifies areas with a potential high loss of life or high loss of property due to an unlikely major fire. Potential high loss of life may result in hotels, nursing homes, theaters, libraries, etc. where large groups of people tend to gather. Businesses, factories and shopping areas etc. may suffer a large property or monetary loss due to a major fire. Other areas not listed may also have the potential for high, fire-related losses.

Hillside and Canyon areas are also high fire hazard areas due to the following factors:

- Structures in the hillside/canyon areas are frequently located adjacent to or within grassland, chaparral, or coastal sage scrub plant communities that can create an extreme fire hazard, particularly in summer months (see Section D-2, Wildfires).

- Hillside/canyon development is frequently located away from the urban center areas where fire protection services are located. Therefore, fire station response times to these outlying areas can be longer than optimal.

- Access to hillside/canyon areas is frequently along steep, narrow, or winding roads that can hinder Fire District access. This can seriously affect response time due to the increase in time it takes heavy apparatus to climb steep streets.

- Hillside locations often have marginal or inadequate fire flow capabilities that can hinder fire protection efforts.

As the number of service request calls to outlying areas increases, emergency response personnel and equipment will be removed from the central urban areas for longer periods of time. A temporary shortage of fire suppression/emergency response capabilities in the more highly urbanized areas may result and other fire stations will be required to be the first respondents outside of their normal service areas, increasing response times.

Inadequate fire flow (water available to fight a fire) can also hamper the Fire District's success in suppressing a fire. Peak fire flows must be included when determining the peak load water supply requirements for the City. Unincorporated areas near the city that have been identified as needing future improvement to fire flow capabilities include:

- o Tierra Rejada Valley area
- o Friendly Village mobile homes, Tierra Rejada Road
- o Santa Susana Knolls

County and City roads must be built to allow adequate access for fire fighting equipment. The Ventura County Fire Protection District has adopted the county road standards which define minimum road widths, number of exits and entrances to a development, etc. Similar private road standards are presently being developed by the County.

The urban fire hazard can be reduced through continued public awareness of fire prevention, enforcement of the Uniform Fire Code, and enforcement of County and City ordinances that regulate construction standards, fire flow requirements, minimum road widths, subdivision design, maximum cul-de-sac lengths, and weed abatement/brush control. Adequate evacuation signing and regular fire drills in structures with large numbers of people would also reduce the fire hazard.

2. Wildfire

a. General Description. Rugged hills and mountains surrounding the City are covered mostly with grasses, brush, and scattered oaks. The climate in this area is generally referred to as "Mediterranean" with rainfall concentrated during the cool winter months. The rains usually cease sometime in May and resume in November. The summer drought causes vegetation to become extremely dry. Hillside areas of the City therefore become hazardous fire areas.

A regional weather phenomenon, the "Santa Ana" winds, can aggravate an already hazardous fire situation. When a low pressure trough develops off the coast and high pressure settles over the Great Basin of Nevada and Utah and over the deserts of eastern California and Arizona, the normal westerly wind flow is

reversed and air pours in from the deserts to the north and east. The desert "Santa Ana" winds arrive as seasonally warm, dry, and charged with static electricity. The extreme dryness, often 5 percent or less relative humidity, further desiccates the vegetation. Finally, "Santa Ana Winds" tend to be downslope winds, causing fires to move very fast downwind and downhill, creating very difficult fire fighting conditions.

Other factors also increase the fire hazard. Dense vegetation growth and large accumulations of dead plant material in areas that have not been burned for many years increase the wildfire hazard. Steep terrain compounds the wildfire risk because fires will normally burn much faster uphill. Rugged terrain will also hinder fire suppression attempts by hampering the mobility and effectiveness of firefighters and equipment.

Wildfires are ignited 90 percent of the time by human action. Over one-third of all wildland fires originate alongside roads and highways, probably as a result of cigarettes or matches being thrown from passing automobiles. Despite rising penalties, approximately 22 percent of all fires recorded statewide result from the act of arson.

Other causes of wildfires include the following. Approximately 23 percent of all the wildfires that burn over 5,000 acres are caused by power line failure. Wildfires can be ignited by sparks from off-road vehicles, construction equipment, and other power-driven equipment used in industry, agriculture, and recreation. In developed areas, wildfires can start from children playing with matches, bonfires, rubbish burning, sparks from chimneys, and fireworks. Natural causes, primarily lightning, are now relatively minor causes of local fires.

Responsible public agencies in California and Ventura County have developed elaborate systems for fighting brush fires. When weather conditions become severe, all fire fighting personnel are put on alert. When a fire starts, all available personnel are rushed to the scene to keep the fire from developing into a major blaze. If the fire does get out of control and more than the County's own resources are required, mutual aid agreements are in effect with neighboring cities, counties, and State and Federal agencies (i.e., California Office of Emergency Services and U.S. Forest Service).

b. Effects of the Hazard. Wildfires generally have the most impact on the natural environment. Although some ecosystems are dependent upon recurrent fire to survive, these communities are unique. Watershed, wildlife, and recreation areas are lost due to wildfire. After the fire has been extinguished, the burned land is laid bare of its protective vegetation cover and is susceptible to excessive run-off and erosion. The fire will often destroy the root systems of shrubs and grasses that aid in stabilizing slope material. When the winter rains come, the possibility of severe landslides and debris/mud flows is greatly increased.

Public utilities are often strained by the impacts of wildfire. Water reserves are depleted, power lines are downed, telephone service can be disrupted, roads can be blocked, etc. Flood control facilities may be inadequate to handle an increase in storm runoff, sediment and debris from barren, burned-over hillsides.

c. Inventory of the Local Wildfire Hazard. Large wild fires occur in the Simi Valley area every 2 to 5 years. In general, wildfire hazard exists in the vegetated hillside and canyon areas surrounding the city. The high wildfire hazard area is shown on Figure 19. Hillside developments within natural brush areas are particularly susceptible to destruction by wildfires.

d. Local Resources Affected by the Hazard. The only existing critical structures located in the high wildfire hazard zone are Edison Company distribution lines. Oil production and storage facilities are also located in areas susceptible to high fire hazards. Numerous residential areas are, however, in and adjacent to the hazard wildfire area and could be exposed to wildfires and related damage.

The seriousness of a wildfire is dependent upon the conditions present at the time of fire occurrence. The most hazardous fire conditions exist during periods of low humidity and elevated temperatures when dry, strong Santa Ana winds push the wildfire downslope into the developed portions of the City.

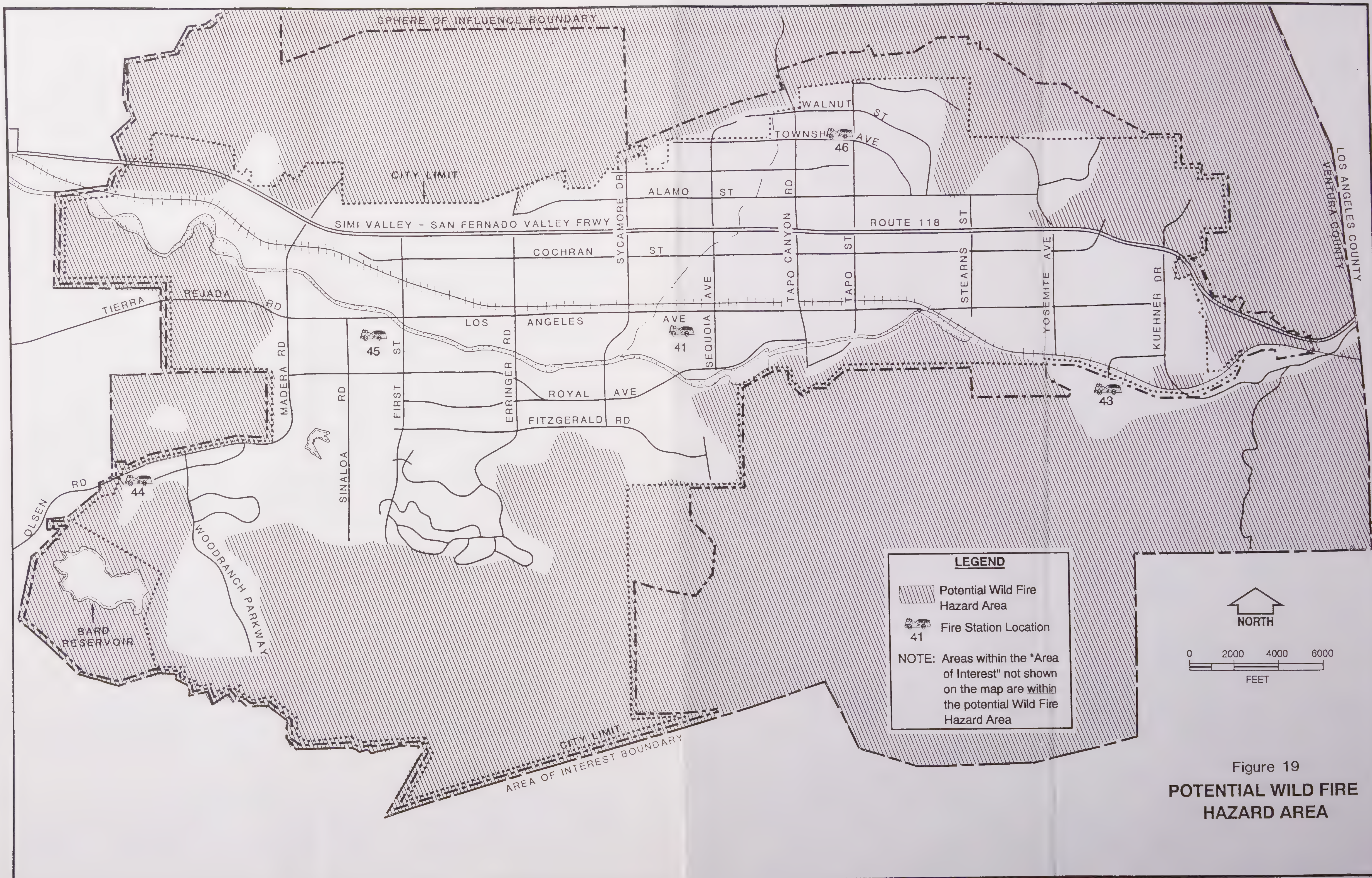


Figure 19

POTENTIAL WILD FIRE HAZARD AREA

E. HAZARDOUS MATERIALS

1. General Description

More than 60,000 chemical substances are manufactured in the United States for use in an almost unlimited number of products. The benefits derived from such extensive use of chemicals are significant; however, the mismanagement of these substances can cause severe health, safety, and environmental damage. Many of these chemicals are commonly used in day-to-day activities, and include such common items as paints, solvents, fuels, acids, cleaning agents, pesticides, and herbicides.

Many manufacturing and commercial establishments as well as households in Simi Valley utilize hazardous materials and generate hazardous waste. Businesses which use hazardous materials and generate hazardous waste include agriculture, oil extraction and service industries, electronic manufacturing, automobile service stations, dry cleaners, repair shops, chemical warehouses, and most types of manufacturing or assembly industries. In the household, hazardous materials include but are not limted to cleaners, insecticides, paints, and gasoline. Household hazardous wastes are a major source of improperly disposed of hazardous waste.

The growing public concern regarding the use and mismanagement of hazardous materials has prompted the passage of numerous federal, state, and local regulations regarding the use, storage, transportation, handling, processing and disposal of hazardous materials and waste. The goal of many of these regulations is to assure adequate control of hazardous materials and waste including tracking hazardous materials from generation to proper disposal. Laws also require hazardous materials- or waste-related businesses to register with the fire department (or other designated agency). Fires in structures which house hazardous materials and waste pose a major threat to emergency service personnel and the public.

Prior to closure of the Class I portion of the Simi Valley landfill in 1980, most of the hazardous waste generated in Simi Valley was disposed of at that landfill. Presently, Class I hazardous waste is disposed of in California at

facilities such as the Kettleman Hills (Kings County) Class I facility or are disposed of at out-of-state Class I facilities.

Improper use, storage, and disposal of hazardous materials and waste can result in surface and groundwater degradation, air pollution, fire, explosion, and poisoning of wildlife, livestock, and humans. Many of the hazardous materials that are commonly used in households and by industry have been linked to increased occurrences of cancer, birth defects, reproductive failures, and other irreversible effects. Hazardous material spills and leaks or the clean-up of illegal waste disposal sites can create potential public health hazards and can result in the expenditure of substantial amounts of public funds.

2. Hazardous Materials Plan and Ordinance

The City of Simi Valley has approved and has implemented a Hazardous Materials Plan and Business Tenancy Certificate Ordinance (Ordinance No. 732, amending Section 4-12, SVC).

The Hazardous Materials Plan requires that all new businesses dealing with hazardous materials obtain a Business Tenancy Certificate from the city. A certification is issued only after the business has acquired all the required permits from other agencies such as the Ventura County Fire Protection District, Ventura County Department of Environmental Health, the Air Pollution Control Board, Simi Valley County Sanitation District, and Simi Valley Building and Safety Division. The Hazardous Materials Plan and Ordinance will be incorporated in this Safety Element by reference and included as an appendix after adoption by the City Council.

The purpose of the Hazardous Materials Plan is to coordinate the efforts of the city with other agencies to assure that all businesses handling, storing, generating, transporting, and/or disposing hazardous materials are in compliance with the agencies' and City's requirements and laws. Long range goals of the plan include developing an "overlay" system to determine the distribution of businesses dealing with hazardous materials/waste and types of hazardous materials/waste being used or generated throughout the City. Limits may be imposed on the number of businesses and types of hazardous materials in a

particular area depending on the distances from residences and expected risk to the public.

While the Hazardous Materials Plan sets forth the logistics of the plan, the Hazardous Waste Ordinance specifies the laws to implement the plan. The ordinance makes it unlawful for businesses to operate without certification from the City and unlawful to do business without posting the certificate. Also, tenants must be informed of the requirements for certification by the City.

3. Inventory of the Local Hazard

In response to the requirements of the Waters Bill (Assembly Bills 2185 and 2187, Health and Safety Code Sections 25500 et. seq.) the Ventura County Fire Protection District has been designated as the administering agency for the City to implement the chemical disclosure laws. The purpose of the legislation is to provide accurate information at all times regarding the location, type, approximate quantity, and health risk of hazardous materials or waste to emergency response personnel, the public and other government officials. As the administering agency, the Fire Protection District compiles and maintains a list of companies and individuals that utilize minimum amounts of specified hazardous material and generate minimum quantities of hazardous waste. This list should be consulted for an up-to-date reference of hazardous material users/waste generators in the City.

4. Regional Planning Programs

In response to the requirements of Assembly Bill 2948 (Government Code Secs. 65963.1 and 66780.8 and Health and Safety Code, Chapter 6.5, Division 20), the County of Ventura has prepared and adopted a Hazardous Waste Management Plan. The plan is required to provide long-range projections for hazardous waste volumes, and to determine recycling, treatment, and transfer and disposal facility needs. If it is determined that new facilities are needed, the Plan must provide siting criteria and general geographic locations of the needed facilities. Hazardous Waste Management Plans must be approved by a majority of the cities in the County that have a majority of the incorporated population.

BLANK PAGE TO END SECTION

F. STRUCTURAL HAZARDS

1. General Description

Discussion of structural hazards in this element is limited to earthquake hazards. Any type of structure, if inadequately designed or constructed to withstand earthquake ground shaking, may experience severe damage or complete collapse during a strong earthquake. It is currently economically infeasible, using modern design and construction techniques to build a totally earthquake-proof structure, so a certain level of risk is inherent regarding structural safety. Because a structure's performance during a strong earthquake is closely related to its design and construction characteristics, the level of risk can be reduced by incorporating appropriate design measures and using appropriate building materials and construction techniques.

Different construction materials have varying strength values and will consequently react to the earthquake forces differently. The shape of a building and the geometry of the earthquake resisting frames as well as connection details can also have a considerable influence on the amount of damage suffered by a building during an earthquake. These and other characteristics will combine to determine the fundamental period of the structure, which is a major factor in determining the response of a building to shaking.

Although all structures exhibit unique response characteristics to strong earthquake-related ground shaking, certain types of buildings utilizing similar building materials and design techniques will have a tendency to react in a similar manner. Listed below is a brief summary of some of the earthquake response characteristics.

- <u>Wood Frame Buildings</u>. Small one- and two-story wood frame structures have withstood the effects of ground shaking quite well. These buildings rarely collapse because of their flexibility and light weight. Large wood frame buildings of two or more stories may be badly damaged during an earthquake, but usually do not totally collapse. Unfortunately, wood frame buildings are fire prone. In some past large

earthquakes, many wood frame buildings survived the earthquake, but were subsequently destroyed by post-earthquake fires.

- Steel Frame Buildings. These buildings are very flexible structures and will usually survive ground shaking quite well. During an earthquake damage may occur, but unless ground rupture occurs beneath these types of buildings, they rarely collapse. However, any poorly constructed building can collapse.

- Reinforced Masonry Buildings. When properly designed and constructed, reinforced masonry structures can survive earthquakes. However, they are brittle, and in strong quakes may crack or collapse. Improper concrete mix, structure design, improper concrete placement, poor quality concrete, inadequate reinforcement, or poor inspection will considerably increase the possibility of building failure.

- Unreinforced Masonry Buildings. This includes such building materials as unreinforced concrete and brick, hollow concrete block, clay tile, and adobe. Buildings constructed from these materials are heavy and brittle with little earthquake resistance. In small earthquakes unreinforced buildings can crack and, in stronger earthquakes, they have a tendency to collapse. These types of structures pose the largest structural hazard to life and safety of all general building types.

  Non-structural items and building components can also influence amounts of damage suffered during an earthquake. Unreinforced parapets and chimneys, facades, signs and building appendages can all be shaken loose during an earthquake, creating a serious risk to life and property.

2. Effects of the Hazard

The primary effect of hazardous structures in the community is the potential for the loss of life and property. During an earthquake, damage to a structure can range from superficial damage to complete and total collapse.

Structural failure also can lead to the disruption of transportation, communication, and power systems, all vital to emergency response. The loss of structures that house vital or critical facilities after a major disaster will seriously hamper emergency rescue operations.

3. Inventory of the Local Structural Hazard

The Simi Valley Building and Safety Division has conducted a city-wide building survey to locate unreinforced masonry structures and other substandard structures. Most construction in Simi Valley has been conventional wood frame homes built after seismic building codes were in place (Dave Bowling, Simi Valley Building and Safety, personal communication). Only two unreinforced masonry structures presently exist in Simi Valley. These include Bottle Village on Cochran Street, east of Tapo Street, and the Pico (Rancho Simi) Adobe in the Strathearn Historical Park at Tierra Rejada Road and Strathearn Place. Bottle Village, as its name implies, was constructed using bottles. The village is presently enclosed by a fence and is not open to the public.

To reduce structural hazards immediately following an earthquake, the City of Simi Valley has cooperated, on an ad hoc basis, in the provision of mutual aid building inspection and damage assessment services. These services are coordinated through the State of California Emergency Preparedness Program.

BLANK PAGE TO END SECTION

III. STANDARDS AND OBJECTIVES

The objective of the Safety Element of the Simi Valley General Plan is to reduce public safety hazard of new development to acceptable levels. The following provide standards for assessing public safety hazards.

A. ACCEPTABLE RISK

Risk associated with natural and man-made hazards can be separated into three categories:

- Acceptable Risk. The level of risk below which no specific action by government is deemed necessary.

- Unacceptable Risk. The level of risk above which specific action by government is deemed to be necessary to protect life and property.

- Avoidable Risk. The risk can be avoided because individual or public goals can be achieved at the same or lower total cost by other means.

The concept of acceptable risk may seem difficult to comprehend at first, but this type of risk is actually a part of everyday life. Almost all activities have some degree of risk associated with them, and natural and artificially induced hazards of some degree and kind are almost always present. A very real and significant hazard in Simi Valley is, for example, the potential for the occurrence of seismically induced ground shaking and resultant building damage. Knowing that a major seismic event will eventually occur, but not knowing when or to what degree the hazard will occur, creates a level of risk. Efforts can be taken, however, to reduce the consequences of known hazards and associated risks.

How safe is safe enough? There is no uniform level of risk that is acceptable to the general public; maximum safety is desirable. In minimizing risks, the cost of providing protection from a hazard generally increases with the severity of the hazard and level of risk reduction required. At some point the cost of providing protection becomes prohibitive when compared to the

benefits derived. The risk then becomes acceptable because the public is no longer willing to pay more to further reduce risk. The public ultimately determines the acceptable level of protection.

To evaluate what is considered to be "acceptable risk" the following factors should be considered:

- o Severity of Potential Losses. Potential losses include loss of life, injury, property damage, and loss of function.

- o Risk Reduction Capabilities. Risk reduction depends on current technological capabilities, available fiscal and manpower resources, and established priorities.

- o Probability of Loss. The probability of future seismic or other adverse hazardous natural occurrences should be evaluated in light of their possible effect on structures or human activites.

- o Adequacy of Basic Data. This is an important factor in estimating the probability that a hazard will occur.

B. CRITICAL FACILITIES

In the hours immediately following the 1971 San Fernando earthquake in Southern California, emergency services were impaired by damage to police and fire stations, communication networks, and utility lines. A number of major hospitals in the area were seriously damaged and were unable to continue functioning at the time they were most needed. These and other facilities are vital to the community's ability to respond to a major disaster and to minimize loss of life and property. The experience in San Fernando emphasized the need to provide "critical facilities" with a higher level of protection from earthquakes than non-critical structures. As a minimum, all structures which could have an effect on the loss of life should be designed to remain standing in the event of a major earthquake even if rendered useless. Critical facilities should not only remain standing, but should be able to operate efficiently after a disaster. Designing

a building to this higher level of safety not only entails a stronger structure, but also greater attention to non-structural items such as elevators, lighting, and storage facilities.

It is recommended that the City solicit public comment as a part of the decision making process in identifying which facilities are to be designated as being "Critical." A suggested list of critical facilities includes, but is not limited to the following: water reservoirs and transmission mains, dams, electrical substations, schools, fire stations, railroad lines, City buildings, hospitals, sewage treatment plants, major water works facilities, radio stations, television stations, microwave stations, law enforcement offices, major highways and bridges, and major underground or overhead utilities, such as gas, petroleum, or electricity. Maps of critical facilities are presented on Figures 20, 21, and 22.

INDEX TO FIGURE 20 - CRITICAL STRUCTURES

1. Madera Elementary
2. Sinaloa Junior High
3. Abraham Lincoln Elementary
4. Royal High School
5. Educational Center
6. Park View Center (Elementary)
7. Hollow Hills Fundamental School (Elementary)
8. Hillside Junior High School
9. Berylwood Elementary
10. Justin Elementary
11. Atherwood Elementary
12. Vista Fundamental
13. Crestview Elementary
14. Mountain View Elementary
15. Simi Elementary
16. Apollo High School
17. Sycamore Elementary
18. Sequoia Junior High
19. Garden Grove Elementary
20. Santa Susana Elementary
21. Township Elementary
22. Valley View Junior High
23. Big Spring Elementary
24. Simi Valley High School
25. Katherine Elementary
26. White Oak Elementary
27. Knolls Elementary
28. Calleguas Municipal Water District Main Pipeline Valve Access Station
29. Calleguas Municipal Water District Main Pump Station
30. Civic Center
    - o City Hall
    - o Development Services Building
    - o East County Courthouse
    - o Senior Citizens Center
    - o Department of Motor Vehicles
31. Police Department Emergency Band Radio Station
32. Waste Treatment Plant Public Services Center East County Animal Control Facility
33. Fire Station #45
34. Fire Station #41
35. Fire Station #46
36. Fire Station #43
37. Fire Station #44
38. Adventist Hospital
39. Ventura County Public Health Regional Health Center
40. Cellular Telephone Towers
41. East Valley Sheriffs Station

Figure 20
CRITICAL FACILITIES
Structures & Transportation

McClelland consultants

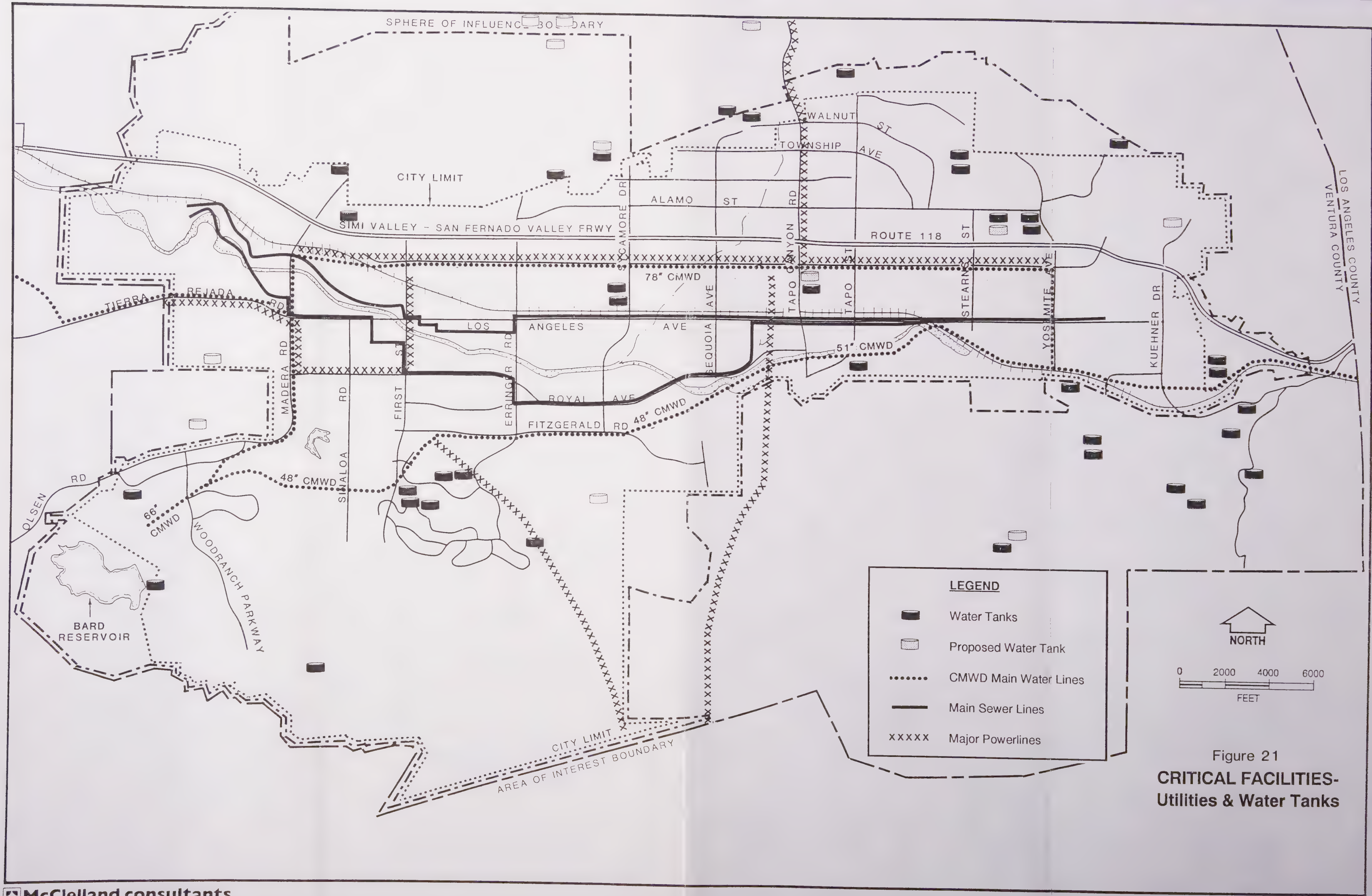


Figure 21
CRITICAL FACILITIES-
Utilities & Water Tanks

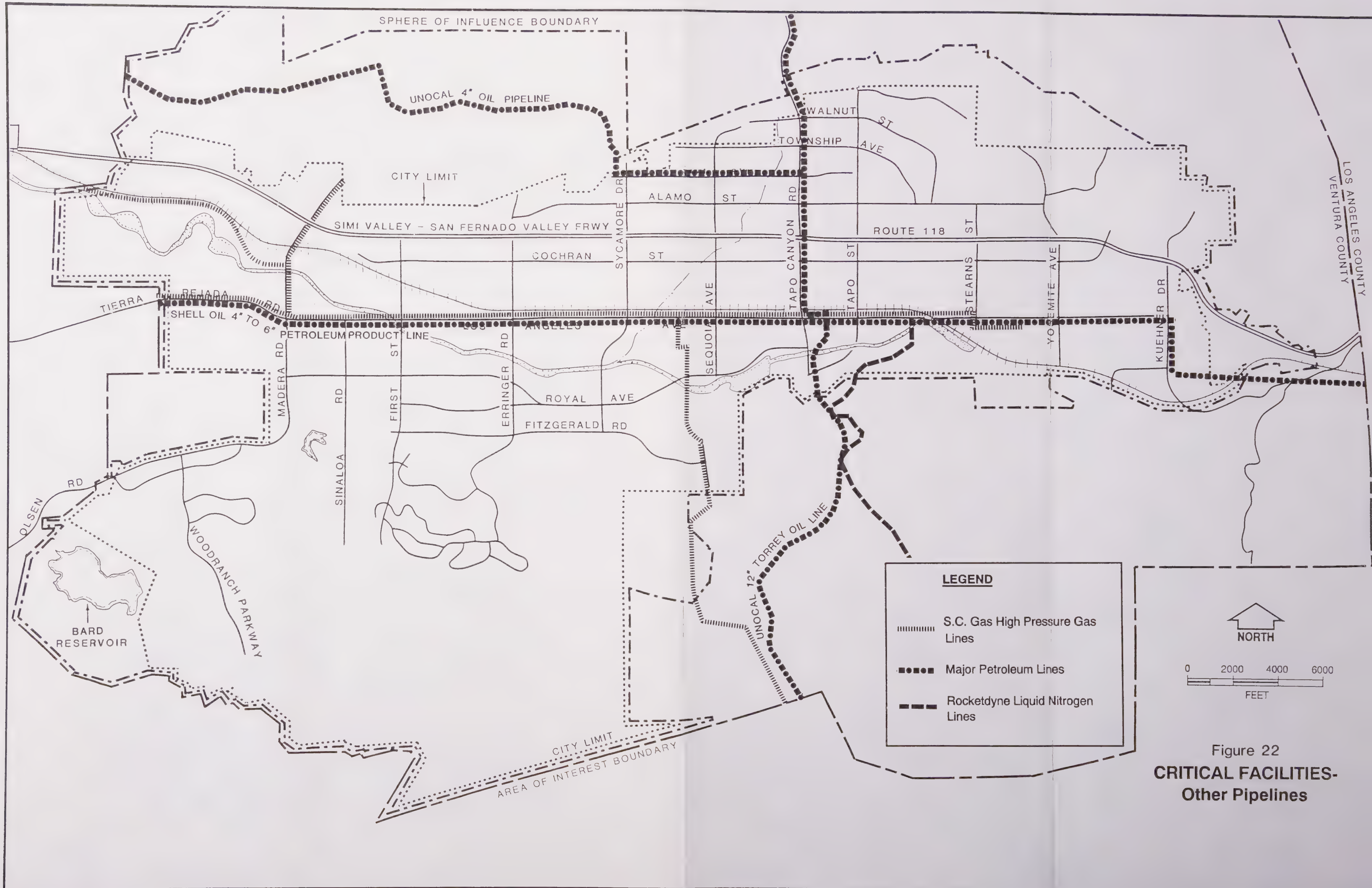


Figure 22
CRITICAL FACILITIES-Other Pipelines

IV. PROGRAMS

The following Federal, State, and local programs support the objectives of the Safety Element by reducing public safety hazards within the City of Simi Valley. A detailed list of California State laws which apply to the Safety Element is included in Appendix D.

A. GEOLOGIC-SEISMIC HAZARDS

1. Alquist-Priolo Special Studies Zones Act

In 1972, the California Legislature enacted the Alquist-Priolo Special Studies Zones Act. The purpose of this Act is to ensure that structures for human occupancy are not built on active faults by requiring a geological investigation for new development within designated special studies zones. The Act requires the State Geologist to delineate special studies zones around all potentially and recently active traces of major faults in California.

The regulation of the State Mining and Geology Board, which governs the Alquist-Priolo Special Studies Zones, provides that:

> No structure for human occupancy, identified as a project under Section 2621.6 of the Act, shall be permitted to be placed across the trace of an active fault. Furthermore, the area within fifty (50) feet of an active fault shall be assumed to be underlain by active branches of that fault unless and until proven otherwise by an appropriate geologic investigation and submission of a report by a geologist registered in the State of California. This 50-foot standard is intended to represent minimum criteria only for all structures. It is the opinion of the Board that certain essential or critical structures, such as high-rise buildings, hospitals, and schools should be subject to more restrictive criteria at the discretion of cities and counties. Moreover, it is recommended that a geologic report by a geologist registered in the State of California be required for a single-family dwelling otherwise exempted under Section 2621.6, if that structure lies on or within 100 feet of the trace of a historically active or other known active fault as

> shown on Special Studies Zone Maps or by more precise or detailed information known to the approving authority." (Title 14, California Administrative Code Section 3602(a))

No Alquist-Priolo zones presently exist in the Simi Valley area. However, the Simi-Santa Rosa fault has the potential to be considered active and could be classifid as a special studies zone in the future.

2. Geologic Hazard Abatement Districts (GHAD)

Cities may create Geologic Hazard Abatement Districts (GHAD) to finance the prevention, mitigation, abatement or control of geologic hazards such as landslides, land subsidence, soil erosion, or earthquakes. A GHAD can acquire property by purchase, gift, or eminent domain; can construct improvements; and can maintain and repair any improvements. Landowners within the GHAD boundaries share the cost of these activities.

A GHAD may be created by a resolution of the City or County or by petition of owners of at least 10 percent of the affected property. The City or County must hold a public meeting at which are presented the prospective district boundaries and a geologic hazard report. The report must contain a plan for prevention, abatement, or control of the hazard.

3. Landslide Hazard Identification Program

Under the state Landslide Hazard Identification Program, maps of landslide hazards within urban and urbanizing areas are developed. The maps can then be used by cities and counties in land use planning to avoid or mitigate landslide hazards.

4. Hillside Performance Standards

The Hillside Performance Standards are a comprehensive planning program established by the City of Simi Valley to address the special problems associated with hillside and canyon development. The overall purpose of the program, as stated in Section 9-1.1601 of the Standards, is to:

> "... implement those provisions of the General Plan of the City of Simi Valley as they relate to the preservation of hillside areas, the promotion of single family, detached housing in hillside areas, the maintenance of open space, the retention of scenic and recreational resources of the City and to further enhance the public health, safety or welfare by regulating development in hillside areas."

The plans and policies contained in the Hillside Performance Standards provide the City Council, Planning Commission, and citizens with an overall guide to the long-range future development of hillside areas.

5. <u>Uniform Building Code</u>

Building safety and construction in Simi Valley is regulated by the requirements set forth by the State Building Code which has adopted and amended the Uniform Building Code (UBC). Further modifications to the UBC are set forth in the Simi Valley Municipal Code, Section 8-1.01 (Ordinance No. 713, October 26, 1989). The UBC requirements are updated every three (3) years by the International Congress of Building Officials and are subsequently amended and adopted by the State and City. The UBC represents current modern practice in building safety and the construction of earthquake-resistant structures. Also specified in the UBC are requirements for grading such as the angle of cut and fill slopes, drainage on pads and slopes, set back of structures from slopes, and erosion control. In conformance with the UBC, the Simi Valley Building and Safety Department requires that soil reports be prepared for all new structures used for human occupancy. These soil reports are needed to assess on-site soil conditions for such potential hazards as expansive soils, liquefaction, and landslides.

B. FLOODING

1. <u>Federal Flood Insurance Program</u>

The Federal Emergency Management Agency has designated "Areas of Special Flood Hazard" within the City. The basis of the areas designated is a Federal Flood Insurance Study and Flood Insurance Rate Map (FIRM) that may be periodically amended by the Federal Flood Insurance Administration.

2. Cobey-Alquist Flood Plain Management Act

The state Flood Plain Management Act encourages local governments to plan, adopt, and enforce land use regulation in flood plain management. The act also outlines requirements for receiving state financial assistance for flood control.

C. FIRE PROTECTION

1. Existing Fire Prevention Programs

In addition to fire suppression services, the Ventura County Fire Protection District conducts fire prevention and public education programs. The Fire Prevention Bureau is responsible for fire investigations, inspections of newly-constructed buildings, storage tanks, and annual inspections of commercial and industrial business establishments. Public education regarding fire prevention and safety, disaster preparation, and fire extinguisher demonstrations are conducted during numerous public programs. In conjunction with the Simi Valley School District, all fifth graders participate in a Junior Fire Department program.

Ordinance 14 has been adopted by Ventura County to improve fire prevention and suppression. Provisions of the ordinance are listed below:

- Smoke Detectors. Smoke detectors are required in all new and existing dwellings throughout the City.

- Fire Retardant Roofing. Fire retardant roofing materials are required on all new structures. No wood roofs are allowed in high fire hazards and existing structures can maintain up to 50 percent wood on the roofs before needing to be replaced with a completely fire retardant roof. The City's ordinance 713 has similar requirements for roofs. Untreated (pressure treatment) wood roofs are not permitted to be installed in the City.

- Automatic Sprinklers. Ordinance 14 requires that all new structures that are over 5,000 square feet in gross floor area or are more than 5 miles from a fire station be equipped with automatic fire sprinklers.

- o <u>Weed Abatement</u>. Weeds must be cleared from all vacant lots and within 100 feet (or within 200 feet in high fire hazard areas) of all structures. Non-compliance with this provision can result in the Fire Protection District hiring crews to remove the weeds and the cost of the weed removal being assessed on the property owner's property tax bill.

Ventura County has adopted and amended the Uniform Fire Code (1982) and adopted the 1991 Uniform Fire Code on January 29, 1991. Also, the County has entered into reciprocal automatic aide agreements with fire departments of Ventura, Oxnard, Fillmore, Santa Paula, the City of Los Angeles, and County of Los Angeles.

D. HAZARDOUS MATERIALS

A considerable number of state, federal, and local laws address hazardous materials and waste. A detailed list of state laws is included in Appendix D. The following paragraphs discuss the two laws most applicable to the cities proposed Hazardous Waste Plan and Ordinance.

The Ventura County Fire Protection District is the administering agency for the Waters Bill (HSC Section 25500 et. seq.). This legislation requires the implementation of the three basic plans described below.

- o <u>Area Plan</u>. This plan is to be prepared by the administering agency to deal with emergency response to releases of hazardous materials.

- o <u>Business Plan</u>. All businesses, companies, or individuals that store or utilize hazardous materials or waste must provide a plan and inventory of those materials to the implementing agency. Businesses that handle less than specified minimum quantities of hazardous materials/waste may be exempt from the reporting requirements.

- o <u>Inspection Plan</u>. The implementing agency must provide an inspection plan for each business using or storing hazardous material or waste and

must design an information management system to make the information available to the first responders, government officials and, where requested, to the general public.

The Ventura County Fire Protection District has been designated as the agency with the primary responsibility for emergency response to spills and releases of hazardous materials or waste on City streets or other properties within the City. For any spills or releases that occur on State highways, the California Highway Patrol has the primary response responsibility.

The County of Ventura and most incorporated cities in the county have adopted or are in the process of adopting the regional Hazardous Waste/Materials Management Plan (Tanner Plan). The objectives of the plan are to:

- Ensure that hazardous waste generators handle, treat, transport, and dispose of hazardous wastes in a legal and safe manner.

- Control abandoned hazardous waste sites to prevent health hazards and environmental damage.

- Reduce incidences of illegal dumping.

- Prepare for emergency responses to accidental and illegal hazardous material discharges.

- Provide comprehensive hazardous waste management planning for source reduction treatment, disposal, and resource recovery of hazardous wastes.

E. STRUCTURAL HAZARDS

A landmark in earthquake safety engineering legislation was passed by California after the 1933 Long Beach earthquake, when the state adopted the Field and Riley acts and established the State Office of Architecture and Construction. The Field Act placed the design of schools under the supervision of the newly created Office of Architecture and Construction. The Riley Act placed design

requirements on buildings used for human occupancy, other than dwellings designed for two families or less. As a general rule, buildings constructed after 1933 have performed better and are generally considered safer than most buildings constructed before 1933. Since 1933, building codes have been continually improved after each major earthquake, new lessons are learned on the adequacy of the old codes.

More recent state legislation has been passed regarding seismically-induced structural hazards. Senate Bill 239 (Green, 1986, H+SC 16000)) requires that construction plans for all essential service structures (fire and police stations, etc.) be reviewed by the State Architect's office or an on-staff registered structural engineer. This legislation is similar to the Hospital Act which was passed soon after the San Fernando earthquake and requires the State Architect's office to review building plans for new hospitals or specified additions to existing hospitals.

Senate Bill 547 (Alquist, GC 8875 et. seq.) went into effect January 1, 1987, and requires all cities located in Seismic Zone 4 (this includes Simi Valley) to conduct an inventory of potentially hazardous structures, including unreinforced masonry buildings. After the survey is conducted, a program to mitigate these potentially hazardous structures must be developed and sent to the California Seismic Safety Commission for review and approval. This structural hazard abatement program must be completed by 1990. Simi Valley has adopted this requirement as the Unreinforced Masonry Ordinance 8-1.13.

F. DISASTER PREPAREDNESS

The City has devised and maintains an up-to-date comprehensive Emergency Plan that addresses the City's planned response to emergency situations. The plan also identifies the sources of outside support which might be provided (through mutual aid and specific statutory authorities) by other jurisdictions, State and Federal agencies, and the private sector. This plan has been reviewed and approved by the California Office of Emergency Services and the Federal Emergency Management Agency. Regional and State-wide coordination of disaster relief operations and resources is the responsibility of the County Office of Emergency Preparedness and the California Office of Emergency Services.

The City's Emergency Plan meets the Governor's Multi-Functional Planning Guidelines which include planning and operational checklists for all the departments during various types of disasters. Guidelines assist the City disaster response departments, such as Police and Public Works, in formulating and executing their specific responsibilities before, during, and after a disaster. Also included in this plan are general standard operating procedures for disaster support organizations (American Red Cross, Salvation Army, etc.) during various types of disasters. The City Attorney's office has a subplan to the Emergency Plan which contains special legislation addressing natural and man-made disasters.

The City also maintains a City-wide Evacuation Plan. This Plan details evacuation routes from the City in the event of a major disaster and specifies emergency shelters to be used during emergency or disaster episodes. The Evacuation Plan must be reviewed and approved by the California Office of Emergency Services.

Evacuation routes out of the City of Simi Valley are by means of major east-west streets and Route 118. There are no major north-south routes out of the city, which has the potential to result in traffic congestion on east-west streets during an evacuation. This situation occurred on January 5, 1989, during an evacuation of about 12,000 people from the west end of the City due to the release of hazardous material from a ruptured chlorine tank.

The disaster response of the responsible City agencies has not yet been tested by a major disaster in the area, however, the City periodically conducts city-wide exercises and drills to simulate disaster response. The City's existing emergency preparedness and evacuation plans are focused on potential natural and man-made disasters, the likely effects and necessary responses.

V. PERSONS CONTACTED

Mike Adams, Emergency Services Coordinator, Simi Valley Police Department

Tom Blake, Registered Engineering Geologist, Staal, Gardner, and Dunne

Dave Bowling, Assistant Building Official, Public Works/Building and Safety

Bill Dugan, Production Technician, UNOCAL Western Division

John Fields, Associate Planner, City of Simi Valley Department of Environmental Services/Planning Division

Pat Havens, City Historian, City of Simi Valley

Keith Harrison, Emergency Services Coordinator, Governor's Office of Emergency Services, Region 1

Pam Irvine, Geologist, State of California Department of Conservation, Division of Mines and Geology

Dr. Michael W. Kuhn, Senior Planner, City of Simi Valley Department of Environmental Services/Planning Division

George Lund, Deputy Chief of Operations, Ventura County Fire Protection District

Kevin Osgerby, Associate Engineer, State of California Department of Water Resources, Division of Safety of Dams

Larry Peterson, Planning Technician, Southern California Gas Company

Jocelyn Reed, Deputy Director, Department of Environmental Services/Compliance Division

Dan Spikerman, Battalion Chief, Ventura County Fire Protection District

Edward Spafford, Captain Station 48 (Piru), Ventura County Fire Protection District

Ted Marsh, Fire Prevention Officer, Fire Prevention Bureau, Ventura County Fire Protection District

Dolores Taylor, Hydrologist, County of Ventura Public Works Agency, Flood Control Department

John Weikel, Hydrologist, County of Ventura Public Works Agency, Flood Control Department

VI. REFERENCES

American Geological Institute (1976), Dictionary of Geological Terms, Ancha Books, New York.

Bishop, E.E., Eckel, E.G. et al. (1978), Suggestions to Authors of the Reports of the United States Geological Survey, Sixth Edition.

California Division of Mines and Geology (CDMG) (1973), Geology and Mineral Resources Study of Southern Ventura County, California, Preliminary Report 14.

California Division of Mines and Geology (CDMG) (1974), How Earthquakes Are Measured, CDMG Note 23.

California Division of Mines and Geology (CDMG) (1975), Recommended Guidelines for Determining the Maximum Credible and the Maximum Probable Earthquakes, CDMG Note 43.

California Division of Mines and Geology (CDMG) (1975), San Fernando, California Earthquake of 9 February 1971, Bulletin 196.

California Division of Mines and Geology (CDMG) (1975), Seismic Hazards Study of Ventura County, California, Open File Report 76-5 LA.

California Division of Mines and Geology (CDMG) (1989), Landslide Hazards in the North Half of the Calabasas Quadrangle, Los Angeles and Ventura Counties, California, CDMG OFR 89-18.

California Division of Mines and Geology (CDMG) (1990a), "Relative Debris-Flow Susceptibility Map," Landslide Hazard Identification Map #22, Simi Valley Area.

California Division of Mines and Geology (CDMG) (1990b), "Relative Landslide Susceptibility Map," Landslide Hazard Identification Map #22, Simi Valley Area.

California Division of Oil and Gas (1977), Subsidence Study of Oxnard Oil Field and Vicinity.

California Partnership of Safe Hazardous Waste Management (1988), Hazardous Materials Program Commentary: California, prepared by ENSCO Environmental Services, Inc.

Campbell, K.W. (1981), "Near Source Attenuation of Peak Horizontal Acceleration," Bulletin, Seismological Society of America, Vol. 71, pp. 2039-2070.

EERI (1988), "Preliminary Isoseismal Map for the October 1, 1987, Whittier Narrows Earthquake," EERI Newsletter, January 1988.

Ertec Western, Inc. (1983), Cone Penetration Testing, K-Mart Site, Simi Valley, California, Ertec Project No. 83-231.

Flood Emergency Management Agency (FEMA) (1985), Flood Insurance Study, Ventura County, California, Unincorporated Areas, Community No. 06043.

Geolabs - Westlake Village (1991), Siesmic Hazard Investigation, Simi Valley Regional Center, City of Simi Valley, California.

Governor's Office of Planning and Research (1989), Partnership Newsletter, November/December 1989.

Hanson, D.W. (1981), Surface and Subsurface Geology of the Simi Valley Area, Ventura County, California, M.S. thesis, Oregon State University.

Hanson, D.W. (1983), "Faulting in the Northern Simi Valley Area," in Genozoic Geology of the Simi Valley Area, Southern California, SEPM Volume and Guide Book.

Jennings, C.W. (1975), Fault Map of California with Locations of Volcanoes, Thermal Springs, and Thermal Wells, California, Division of Mines and Geology, Geologic Data Map No. 1.

Leighton and Associates (1985), Simi Valley West End Ground Water Study, Project No. 3840853-01.

Lung, R. and Weick, R.J. (1987), "Exploratory Trenching of the Santa Susana Fault in Los Angeles and Ventura Counties," in Recent Reverse Faulting in the Transverse Ranges, California, USGS Prof. Paper 1339.

National Oceanic and Atmospheric Administration (NOAA) (1990), National Geophysical Data Center Earthquake Data File.

Rogers, A.M., Tinsley, J.C. and Borcherdt, R.D. "Predicting Relative Ground Response," in Evaluating Earthquake Hazards in the Los Angeles Region - An Earth-Science Perspective, USGS Prof. Paper 1360.

Simila, G.W., Hagan, J.D. and Eliades, P.G. (1983), "Earthquake History of the Simi Valley Area," in Cenozoic Geology of the Simi Valley Area, Southern California, SEPM Volume and Guide Book.

Squires, R.I. (1983), "Geologic Map of the Simi Valley Area, Southern California," in Cenozoic Geology of the Simi Valley Area, Southern California, SEPM Volume and Guide Book.

Squires, R.I. and Filewicz, M.V. (1983), "Introduction," in Cenozoic Geology of the Simi Valley Area, Southern California, SEPM Volume and Guide Book.

State of California (1987), General Plan Guidelines, Governor's Office of Planning and Research.

Stein, R.S. and Yeates, R.S. (1989), "Hidden Earthquakes," Scientific American, June 1989, pp. 48-57.

Transportation Research Board (1978), Landslides, Analysis and Control, Special Report 176.

United States Geological Survey (USGS) (1974), Seismic Hazards and Land Use Planning, Circular 690.

United States Geological Survey (USGS) (1988), Probability of Large Earthquakes Occurring in California on the San Andreas Fault System, Open File Report 88-398.

U.S. Soil Conservation Service (1970), Soil Survey, Ventura Area, California, USDA.

Ventura, County of (April 1985), County-Wide Solid Waste Management Plan.

Yeates, R.S. (1983), "Simi: A Structural Essay," in Cenozoic Geology of the Simi Valley Area, Southern California, SEPM Volume and Guide Book.

Yeates, R.S. (1987), "Late Cenozoic Structure of the Santa Susana Fault Zone," in Recent Reverse Faulting in the Transverse Ranges, California, USGS Prof. Paper 1339.

APPENDIX A

GLOSSARY OF TERMS

Acceleration of gravity - The acceleration of a body falling freely in a vacuum due to the gravitational attraction of the earth (g).

Aftershock - An earthquake which follows a larger earthquake and originates at or near the focus of the larger earthquake.

Alluvial - Pertaining to alluvium.

Alluvium - Detrital deposits resulting from the operations of modern rivers, thus including the sediments laid down in river beds, flood plains, lakes, fans at the foot of mountain slopes, and estuaries.

Anticline - A fold that is convex upward.

Aquifer - Stratum or zone below the surface of the earth capable of producing water as from a well.

Bedrock - Any solid rock exposed at the surface of the earth or overlain by unconsolidated material.

Blind fault - A fault not visible at the ground surface, often associated with an anticline.

Colluvium - Loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity.

Consolidation - Slow process by which water is squeezed out of a clay soil allowing clay particles to rearrange into a denser structure.

Critical facility - Includes facilities housing or serving many people or otherwise posing unusual hazards in case of damage from or malfunction during an earthquake, such as hospitals, fire, police, and emergency service facilities,

utility "lifeline" facilities, such as water, electricity, and gas supply, sewage disposal, and communications and transportation facilities.

Debris basin - A basin which retains loose soil and rock material and other debris carried by a drainage channel. Prevents clogging of downstream flood control facilities.

Debris fence - A fence installed in hillside/canyon areas to slow the velocity of a debris/mud flow.

Debris flow - Viscous, rapidly flowing mixture of unconsolidated, coarse-ground material and water.

Deflection wall - A wall erected in hillside/canyon areas to deflect a debris/mud flow away from a structure, roadway, etc.

Drainage basin - A part of the surface of earth that is occupied by a drainage system or contributes surface water to that system.

Epicenter - The point on the earth's surface directly above the focus of an earthquake.

Expansive soils - Clayey soils that expand or swell when wet and contract or shrink when dried.

Fan or alluvial fan - Cone-shaped deposit of alluvium made by a stream where it runs out onto a level plain or meets a slower stream.

Fault - A fracture in the earth's crust forming a boundary between rock masses that have shifted.

Fault creep - Barely perceptible movement along a fault.

Fault scarp - The cliff formed by a fault.

Fill - Material used to raise the surface of land in a low area or material used to replace existing native material.

Fire hazard zone - An area where, due to slope, fuel, weather, or other fire-related conditions, the potential loss of life and property from a fire necessitates special fire protection measures and planning before development occurs.

Flood frequency - Refers to the number of times a given flood event occurs during some specified time period.

Flood magnitude - Refers to the size of the storm or height of its flood waters.

Flood plain - A lowland or relatively flat area adjoining inland or coastal waters that is subject to a 1% or greater chance of flooding in any given year (i.e., 100-year flood).

Footwall - The mass of rock beneath a fault plane, vein, lode or bed of ore.

Formation - The primary unit of formal mapping or description.

Geomorphic province - Large area or region with similar geomorphology (general configuration of the earth's surface).

Geotechnical evaluation - A professional evaluation using scientific methods and engineering principles of geology, geophysics, hydrology, and related sciences.

Ground acceleration - Rate of change of velocity of ground motion during and earthquake.

Ground failure - Mudslide, landslide, liquefaction, or the seismic compaction of soils.

Ground rupture - See surface rupture.

Ground shaking - Displacement of the ground due to the passage of elastic waves arising from earthquakes.

Hanging wall - The mass of rock above a fault plane, vein, lode, or bed of ore.

Hazardous building - A building that may be hazardous to life in the event of an earthquake.

Hazardous material - An injurious substance, including pesticides, herbicides, toxic metals and chemicals, liquified natural gas, explosives, volatile chemicals, and nuclear fuels.

Hydrocompaction - See "hydroconsolidation."

Hydroconsolidation - Sudden decrease in the volume of a soil deposit upon the addition of water.

Intensity - A number describing the effects of an earthquake on man, on structures, and on the earth's surface.

Landslide - The perceptible downward sliding or falling of a relatively dry mass of earth, rock, or a mixture of the two; sliding is on a definite shear surface.

Lateral spreading - Rapid or gradual loss of strength of soft, saturated soils resulting in flow of the soil laterally.

Liquefaction - A process by which water-saturated granular soils transform from a solid to a liquid state because of a sudden shock or strain.

Magnitude - A quantity characteristic of the total energy release by an earthquake.

Maximum credible earthquake - The most severe earthquake that appears capable of occurring, based on present information, including (a) the seismic history of the area; (b) the length of significant faults within 100 kilometers; (c) the type(s) of faults; and (d) the tectonic or structural history of the region.

Mica - A mineral group consisting of phyllosilicates with sheet-like structures.

Minimum fire flow - A rate of water flow that should be maintained to halt and reverse the spread of a fire.

Mud flow - A viscous, rapidly flowing mixture of unconsolidated material and water with greater than 50% sand, silt, or clay particles.

100-year flood - Flood magnitude that has a 1% chance of being equalled or exceeded in a given year.

Peak discharge - Maximum volume of water passing a point along a channel during a storm.

Peat - Dark brown or black residuum produced by the partial decomposition and disintegration of plant material in marshes.

Period - Time required for a recurrent motion to complete a cycle and begin to repeat itself; inverse of frequency.

Potentially hazardous facility - Includes dams and reservoirs, nuclear reactors, tall buildings, other buildings housing many people, such as schools, prisons, and hospitals, and other structures containing large quantities of potentially explosive or toxic materials.

Pressure ridges - Narrow elevation formed due to compression along a fault.

Reservoir rock - Any rock that contains liquid or gaseous hydrocarbons by virtue of its porosity or joint fracture system.

Reverse fault - A fault along which the hanging wall has been raised relative to the footwall.

Rockfall - Relatively free falling of a newly detached segment of bedrock of any size from a cliff, steep slope, cave, or arch.

Runoff - The portion of rainfall which runs over the surface of the earth rather than being absorbed by the earth.

Rupture - See surface rupture.

Sandstone - A cemented or otherwise compacted detrital sediment composed predominantly of quartz grains.

Scarp - An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or bench.

Seiche - An earthquake-induced wave in a lake, reservoir, or harbor.

Seismicity - The likelihood of an area being subject to earthquakes.

Seismic/vibration compaction - Decrease in volume of a loose, dry granular material in response to vibration.

Settlement - Localized lowering of the ground surface due to a decrease in the volume of the underlying soil.

Shear strength - The internal resistance offered to shear stress.

Shear stress - A stress (force per unit area) causing or tending to cause two adjacent parts of a solid to slide past one another parallel to the plane of contact.

Shist - A medium or coarse-grained metamorphic rock with subparallel orientation of the micaceous minerals which dominate its composition.

Shistose - Having the properties of shist.

Siltstone - A very fine-grained consolidated clastic rock composed predominantly of particle of silt grade.

Soil collapse - See "hydroconsolidation."

Soil creep - The barely perceptible movement of a soil material down a slope.

Subsidence - The gradual, local settling or sinking of the earth's surface with little or no horizontal motion. (Subsidence is usually the result of gas, oil, or water extraction.)

Surface rupture - A break in the ground's surface and associated deformation resulting from the movement of a fault.

Syncline - A fold in rocks in which the strata dip inward from both sides toward the axis.

Tectonic - Of, pertaining to, or designating rock structure and external forms resulting from the deformation of the earth's crust.

Terrace - Relatively flat, horizontal, or gently-inclined surfaces, sometimes long and narrow, which are bounded by a steeper ascending slope on one side and by a steeper descending slope on the opposite side.

Thrust fault - A reverse fault that is characterized by a low angle of inclination with reference to a horizontal plane.

Trenching - Process of excavating a long, narrow depression for the purpose of exposing the subsurface geology and faults.

Tsunami - A wave, commonly called a tidal wave, caused by an underwater seismic disturbance, such as sudden faulting, landslide, or volcanic activity.

Watershed - The area contained within a drainage divide above a specified point on a stream.

Water table - The upper surface of a zone of saturation except where that surface is formed by an impermeable body.

APPENDIX B

[Compiled by Geologic Names Committee, U.S. Geological Survey]

Terms designating time are in parentheses. Informal time terms ("early," "middle," and "late") may be used for the eras, for periods, and for epochs where there is no formal subdivision into Early, Middle, and Late. Informal rock terms ("lower," "middle," and "upper") may be used where there is no formal subdivision of an era, system, or series.

Estimates for ages of time boundaries are under continuous study and are subject to refinement and controversy. Two scales are given for comparison. If neither Geological Society of London nor Berggren reference is used, author should cite the published source he follows. A useful time scale for North American mammalian ages is given by Evernden and others (1964, p. 145–198).

Subdivision in use by the U.S. Geological Survey			Age estimates commonly used for boundaries (in m.y.)	
Era or Erathem	System or Period	Series (Epoch)	Geological Society of London (1964, p. 260–262)	Berggren (1972, p. 195–215)
Cenozoic	Quaternary	Holocene (Holocene)		0.11
		Pleistocene (Pleistocene)		1.8
	Tertiary	Pliocene (Pliocene)		5.0
		Miocene (Miocene)		22.5
		Oligocene (Oligocene)		34.5
		Eocene (Eocene)		53.5
		Paleocene (Paleocene)	66	66
Mesozoic	Cretaceous [1]	Upper (Late) Lower (Early)	136	
	Jurassic	Upper (Late) Middle (Middle) Lower (Early)	190–195	
	Triassic	Upper (Late) Middle (Middle) Lower (Early)	225	
Paleozoic	Permian [1]	Upper (Late) Lower (Early)	280	
	Pennsylvanian [1]	Upper (Late) Middle (Middle) Lower (Early)	[2] 320	
	Mississippian [1]	Upper (Late) Lower (Early)	345	
	Devonian	Upper (Late) Middle (Middle) Lower (Early)	395	
	Silurian [1]	Upper (Late) Middle (Middle) Lower (Early)	430–440	
	Ordovician [1]	Upper (Late) Middle (Middle) Lower (Early)	500	
	Cambrian [1]	Upper (Late) Middle (Middle) Lower (Early)	570	
Precambrian	Precambrian Z [3]		600	
	Precambrian Y [3]		1,600	
	Precambrian X [3]		2,500	
	Precambrian W [3]			

[1] Includes provincial series accepted for use in U.S. Geological Survey reports. See facing page.
[2] Geological Society of London (1964, p. 222).
[3] Informal time divisions.

SOURCE: Bishop et al., 1978

GEOLOGICAL TIME SCALE

APPENDIX C

MODIFIED MERCALLI INTENSITY SCALE OF 1931

The first scale to reflect earthquake intensities was developed by de Rossi of Italy, and Forel of Switzerland, in the 1880s. This scale, with values from I to X, was used for about two decades. A need for a more refined scale increased with the advancement of the science of seismology, and in 1902 the Italian seismologist, Mercalli, devised a new scale on a I to XII range. The Mercalli Scale was modified in 1931 by American seismologists Harry O. Wood and Frank Neumann to take into account modern structural features:

I Not felt except by a very few under especially favorable circumstances.

II Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.

III Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibration like passing of truck. Duration estimated.

IV During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.

V Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.

VI Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.

VII Everybody runs outdoors. Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.

VIII Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.

IX Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.

X Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.

XI Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.

The Modified Mercalli intensity scale measures the intensity of an earthquake's effects in a given locality, and is perhaps much more meaningful to the layman because it is based on actual observations of earthquake effects at specific places. It should be noted that because the data used for assigning intensities can be obtained only from direct firsthand reports, considerable time—weeks or months—is sometimes needed before an intensity map can be assembled for a particular earthquake. On the Modified Mercalli intensity scale, values range from I to XII. The most commonly used adaptation covers the range of intensity from the conditions of "I—not felt except by very few, favorably situated," to "XII—damage total, lines of sight disturbed, objects thrown into the air." While an earthquake has only one magnitude, it can have many intensities, which decrease with distance from the epicenter.

SOURCE: CDMG, 1974, Note 23

MODIFIED MERCALLI INTENSITY SCALE

APPENDIX D

CALIFORNIA STATE LAWS PERTAINING TO THE SAFETY ELEMENT

GENERAL

- Government Code Section 65302 - Requires the general plan to have a safety element.

- Assembly Bill 890 (Chapter 1255) (1989) - The city must submit a draft safety element along with technical studies to the California Division of Mines and Geology for review 45 days prior to local action on the document. City must consider CDMG's advice and must send its adopted or revised element to the CDMG.

GEOLOGIC-SEISMIC HAZARDS/SLOPE AND GROUND STABILITY HAZARDS

- Alquist-Priolo Special Studies Zones Act (1972) - Purpose is to delineate special zones along active faults in California and regulate development within these zones to reduce the hazards of fault rupture.

- Public Resources Code Section 26500 et seq. - Authorizes a city to create an assessment district (Geologic Hazard Abatement District, GHAD) to finance the prevention, mitigation, abatement, or control of geologic hazards such as landslides, land subsidence, soil erosion, or earthquakes.

- Public Resources Code Sections 26525-26567 - Outlines the procedure for forming a GHAD.

- Uniform Building Code, Chapter 70 (1988) - Sets forth rules and regulations to control excavation, grading, earthwork construction, including fills and embankments; establishes the administrative procedure for issuance of permits; and provides for approval of plans and inspection of grading construction. Adopted by the state, county, and city with amendments.

- Public Resources Section 2686(a) and 2687(a) - As part of the Landslide Hazard Identification Program, the State Geologist is required to "develop maps of landslide hazards within the urban and urbanizing areas of the state." Encourages lead agencies to use such maps in land use planning and decision making which affects building, grading, and development permits.

WATER HAZARDS

- Cobey-Alquist Flood Plain Management Act - Encourages local governments to plan, adopt, and enforce land use regulations for flood plain management. Sets forth requirements for receiving state financial assistance for flood control.

- Government Code 8589.5 - Requires a dam inundation map and an evacuation plan in case of inundation due to dam failure for all dams under the state's jurisdiction.

FIRE HAZARDS

- Uniform Fire Code (1988 Edition) - Model code setting construction standards for buildings and pertaining fixtures in order to prevent or mitigate hazards due to fire or explosion. Amended by the state.

HAZARDOUS MATERIALS

- Cortese Bill (AB2013) - Owners of underground tanks were required to register the tanks with State Water Resources Control Board by July 1, 1984.

- Sher Bill (AB1362) - Established a program for statewide regulation of underground storage tanks including construction and monitoring and reporting of discharges. The purpose of this bill is to protect the groundwater from contamination.

- Waters Bill (AB2185/2187) - Local governments must regulate the storage of hazardous materials by businesses. An emergency response plan is required to deal with releases of hazardous materials.

- La Follette Bill (AB3777/1059) - Expands the Waters Bill for businesses using "acutely hazardous materials."

- Tanner Bill (AB2948) - Requires county to prepare a "County Hazardous Waste Management Plan." Purpose is to make each county capable of managing hazardous waste generated within the county by providing long-range projections of hazardous waste volumes and by determining recycling, treatment, transfer and disposal facility needs.

- State Superfund: Carpenter-Presley-Tanner Hazardous Substance Account Act - Creates State policies and procedures for the identification and cleanup of sites contaminated by hazardous substances and creates the "Hazardous Substance Account" as the source of funds for the toxic cleanup.

- Katz Bill: Toxic Pits Cleanup Act - Strictly limits discharge of liquid hazardous wastes into ponds, pits, and lagoons.

- Calderon Bill (AB3525/3374) - State Water Resources Control Board and the California Air Resources Board are required to collect and analyze data on hazardous waste discharge into the air and water from sanitary landfills.

- Eastin Bill (AB2448) - Creates a State superfund for solid waste landfills.

- State Hazardous Waste Control Law - State "cradle to grave" regulation of hazardous waste.

- Roberti Bill (SB1500): Hazardous Waste Management Act - Promotes reduction of hazardous waste generation, increased recycling and treatment of hazardous waste, and land disposal of residual from treated hazardous waste.

- Farr (AB685/1961), Killea (AB2489/2490), Bronzan (AB2234), and Garamendi (SB788) - Provide technical and financial assistance to hazardous waste source reduction, recycling, and treatment.

- Tanner (AB1809) - Each county as part of the County Solid Waste Management Plan must include a program for safe management of household hazardous wastes.

- Proposition 65: Safe Drinking Water and Toxics Enforcement Act - Restricts discharge and use of chemicals on the Governor's list of chemicals known to cause cancer or reproductive toxicity. Requires public notice of presence of toxic materials onsite.

- State Asbestos Regulation - Addresses asbestos abatement in public and commercial buildings. Supplements federal regulations which concern asbestos in schools and protection of asbestos abatement workers.

- Toxic Air Contaminants (AB1807/1223/2588) - Series of laws which aim to protect ambient air quality and control toxic air emissions.

- Porter-Cologne Water Quality Control Act - The purpose is to maintain the highest quality of state drinking water possible by coordinating the regulatory control over all activities that may affect the quality of water.

- State Pesticide Regulation - Regulates the use of pesticides. Implement provisions of and adopts additional laws to the Federal Insecticides, Fungicide, and Rodenticide Act.

- Transportation of Hazardous Materials and Wastes - State and Federal laws which impose restrictions on transportation of hazardous materials/wastes. The state oversees vehicle and drivers safety requirement and restricts routes and timing for transport of hazardous material.

STRUCTURAL HAZARDS

- Uniform Building Code (UBC) - Adopted by State as Title 24, California Code of Regulations. The UBC is a model code which covers the fine, life, and structural safety aspects of all buildings and related structures.

- Field and Riley Acts - Legislation concerning the design of schools and other buildings used for human occupancy. Enacted after the 1933 Long Beach earthquake.

- Green Bill (SB239) (1986). Requires that all construction plans for essential service structures (fire stations, police stations, etc.) be reviewed by the State Architect's office or an on-staff registered structural engineer.

- Alquist Bill (SB547) - Mandated that cities and counties located within seismic zone 4 inventory all of the potentially hazardous unreinforced masonry buildings within their jurisdiction by January 1, 1990 (Government Code Section 8875 et seq.).

- Proposition 77 - Authorizes the sale of $80 million in general obligation bonds to finance low interest loans for the rehabilitation of unreinforced masonry apartment buildings.

DISASTER PREPAREDNESS

- Emergency Services Act of 1970 (as amended) - Creates the State office of Emergency Services and sets forth rules and regulations for local government during a disaster.